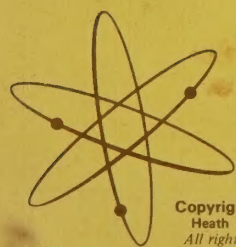
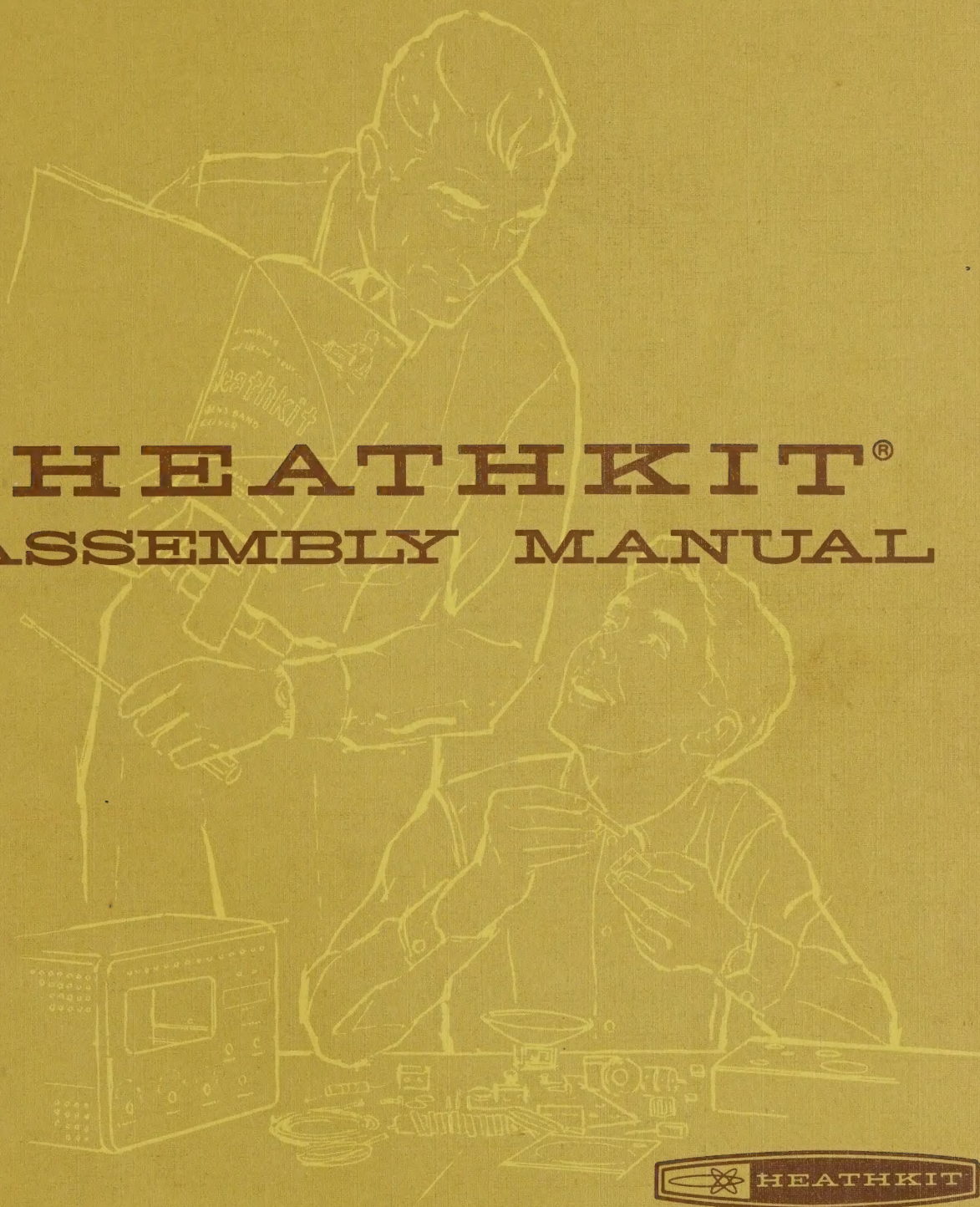


PRICE \$2.00

HEATH COMPANY • BENTON HARBOR, MICHIGAN

# HEATHKIT® ASSEMBLY MANUAL



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**DELUXE METAL LOCATOR**  
**MODEL GD-348**

595-1431-01



Dear Customer:

The Heathkit electronic product you have purchased is one of the best performing electronic products in the world.

Here's how we aim to keep it that way:

### Your Heathkit Warranty

During your first 90 days of ownership, any parts which we find are defective, either in materials or workmanship, will be replaced or repaired free of charge. And we'll pay shipping charges to get those parts to you — anywhere in the world.

If we determine a defective part has caused your Heathkit electronic product to need other repair, through no fault of yours, we will service it free — at the factory, at any retail Heathkit Electronic Center, or through any of our authorized overseas distributors.

This protection is exclusively yours as the original purchaser. Naturally, it doesn't cover damage by use of acid-core solder, incorrect assembly, misuse, fire, flood or acts of God. But, it does insure the performance of your Heathkit electronic product anywhere in the world — for most any other reason.

### After-Warranty Service

What happens after warranty? We won't let you down. If your Heathkit electronic product needs repairs or you need a part, just write or call the factory, your nearest retail Heathkit Electronic Center, or any Heath authorized overseas distributor. We maintain an inventory of replacement parts for each Heathkit model at most locations — even for many models that no longer appear in our current product line-up. Repair service and technical consultation are available through all locations.

We hope you'll never need our repair or replacement services, but it's nice to know you're protected anyway — and that cheerful help is nearby.

Sincerely,

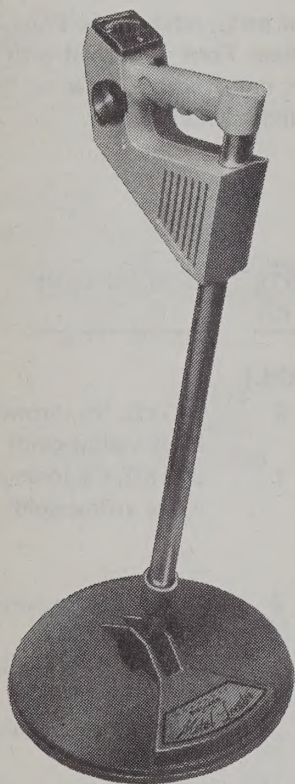
HEATH COMPANY  
Benton Harbor, Michigan 49022



# Assembly and Operation of the



## DELUXE METAL LOCATOR MODEL GD-348



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HEATH COMPANY  
BENTON HARBOR, MICHIGAN 49022



## INTRODUCTION

Your Heathkit Model GD-348 Deluxe Metal Locator is a highly sensitive instrument for finding buried or hidden metals. Because it is simple to operate, anyone—amateur, hobbyist, or professional — can use it to pinpoint metal objects with accuracy. This lightweight unit is designed for comfortable handling to provide many hours of exciting treasure hunting, even by youngsters.

Separate Sensitivity and Null controls are provided for unlimited versatility in varying geological locations. A speaker and a meter are provided to give you both a visual and audible indication when metal is detected. A jack for headphones is also provided for use in areas where the surrounding noise level is high. In addition, the search coil

housing is designed for submersible operation in up to two feet of water.

Rugged construction, versatility of operation, and modern styling make your Deluxe Metal Locator dependable and a pleasure to use. New uses will be found each day to add to your enjoyment and adventure.

*Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.*

## PARTS LIST

Check each part against the following list. The key numbers correspond to the numbers in the Parts Pictorial (fold-out from Page 5).

NOTE: Any part that is packaged in an individual envelope with its part number on it should be placed back in the envelope, after it is identified, until it is called for in a step.

To order replacement parts, refer to the Price Each column and use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" in the "Kit Builders Guide."

KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each
-----------------	--------------	-------------	---------------

### RESISTORS

NOTE: Unless it is described otherwise, each of the following resistors has a tolerance of  $\pm 10\%$ .

#### Composition

A1	1-103	1	33 $\Omega$ (orange-orange-black)	.10
A1	1-6	2	470 $\Omega$ (yellow-violet-brown)	.10
A1	1-9	4	1000 $\Omega$ (brown-black-red)	.10
A1	1-89	1	2400 $\Omega$ , 5% (red-yellow-red-gold)	.10
A1	1-51	1	6800 $\Omega$ , 5% (blue-gray-red-gold)	.10
A1	1-109	5	12 k $\Omega$ , 5% (brown-red-orange-gold)	.10
A1	1-69	2	18 k $\Omega$ (brown-gray-orange)	.10
A1	1-58	1	22 k $\Omega$ , 5% (red-red-orange-gold)	.10
A1	1-60	1	68 k $\Omega$ (blue-gray-orange)	.10

KEY PART No.	PARTS No.	DESCRIPTION	PRICE Each
-----------------	--------------	-------------	---------------

### Composition (Cont'd.)

A1	1-104	3	100 k $\Omega$ , 5% (brown-black-yellow-gold)	.10
A1	1-77	1	390 k $\Omega$ , 5% (orange-white-yellow-gold)	.10

### Film

A2	4-58	2	150 $\Omega$ , 5% (brown-green-brown-gold)	.10
A2	4-61	1	560 $\Omega$ , 5% (green-blue-brown-gold)	.10
A2	4-63	2	2700 $\Omega$ , 5% (red-violet-red-gold)	.10
A2	4-38	3	9100 $\Omega$ , 5% (white-brown-red-gold)	.10

### CAPACITORS

B1	21-150	1	820 pF ceramic	.10
B2	20-137	1	1800 pF mica	.45
B2	20-150	1	3300 pF mica	1.05
B3	27-68	1	.0033 $\mu$ F Mylar* (3300)	.40

\*DuPont Registered Trademark



KEY PART	PARTS	DESCRIPTION	PRICE
No. No.	Per Kit		Each

### Capacitors (Cont'd.)

B3	27-74	4	.01 $\mu$ F Mylar	.10
B3	27-63	1	.022 $\mu$ F Mylar	.10
B3	27-73	1	.047 $\mu$ F Mylar	.15
B3	27-47	3	.1 $\mu$ F Mylar	.20
B4	25-253	5	33 $\mu$ F tantalum	.45

### DIODES-COIL-CONTROLS

C1	56-56	3	1N4149 diode	.20
C1	56-63	1	MZ500-10 zener diode	.90
C2	10-932	1	50 k $\Omega$ LIN (linear) control	1.35
C3	10-933	1	5000 $\Omega$ LIN (linear) control	.85

### TRANSISTORS

NOTE: Transistors are marked for identification in one of the following four ways:

1. Part number.
2. Transistor type number.
3. Part number and transistor type number.
4. Part number with a transistor type number other than the one listed.

D1	417-94	1	2N3416	1.00
D1	417-118	3	2N3393	.40
D1	417-201	6	X29A829	.50

### HARDWARE

#### #6 Hardware

E1	250-324	2	6-32 x 3/16" screw	.05
E2	250-170	2	#6 x 1/4" sheet metal screw	.05
E3	250-597	6	6-20 x 3/8" self-tapping screw	.05
E4	250-1133	4	6-20 x 7/8" self-tapping screw	.05
E5	250-1126	1	#6 x 1" self-tapping screw	.15

#### Control Hardware

F1	254-5	3	Control lockwasher	.05
F2	253-75	3	Control flat washer	.05
F3	252-76	3	Control nut	.10

KEY PART	PARTS	DESCRIPTION	PRICE
No. No.	Per Kit		Each

### Miscellaneous Hardware

G1	253-164	4	#4 spring washer	.05
G2	255-166	4	#4 shoulder spacer	.05
G3	204-1840	2	Angle bracket	.10
G4	250-1125	1	10-32 x 1-9/16" threaded spacer	.25
G5	252-160	1	Locknut	1.35

### WIRE CABLE

340-11	1	Large bare wire	.05/ft
344-96	1	Blue stranded wire	.05/ft
344-59	1	White hookup wire	.05/ft
347-1	1	8-wire cable	.15/ft
347-30-1	1	4-wire spiral cable	2.00

### PLASTIC PARTS

H1	92-68	1	Coil housing	9.00
	92-73	1	Handle assembly	8.00
	consisting of:			
H2	92-69	1	Left handle half	
H3	92-70	1	Right handle half	
H4	462-366	2	Knob	.45
	252-128	2	Thumbnut	.25
H5	266-263	1	Shaft liner	7.35
H6	266-268	1	Nylon bushing	.35
H7	266-269	1	Nylon guide	.15
H8	73-59	2	Rubber grommet (1 extra)	.10
H9	75-107	1	Strain relief	.10
H10	73-39	1	Foam tape	.10/ft

### ELECTRICAL PARTS

J1	60-11	1	Slide switch	.20
J2	432-33	1	Battery connector	.25
J3	436-26	1	Phone jack	.85
J4	401-118	1	Speaker	4.65
J5	407-134	1	Meter	6.50

### LABEL-INSERTS

390-289	1	Battery label	.10
391-34	1	Blue and white label	
390-981	1	Nameplate label	.40
391-66	2	Thumbnut insert	.15



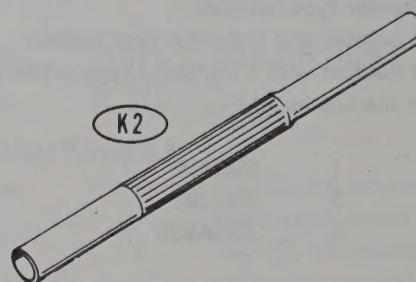
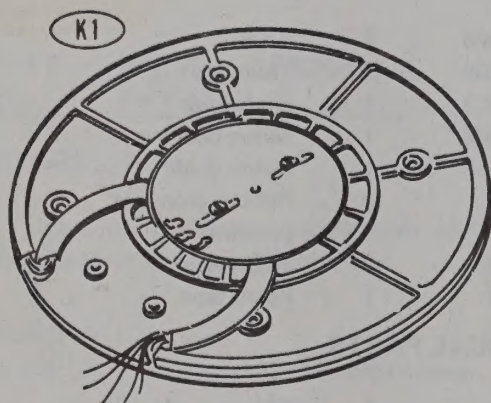
KEY PART		PARTS	DESCRIPTION	PRICE
<u>No.</u>	<u>No.</u>	<u>Per Kit</u>		<u>Each</u>
GENERAL				
	85-1180-2	1	Audio circuit board	.95
	85-1181-2	1	Search coil circuit board	.80
K1	100-1098	1	Search coil	13.75
	266-261	1	Inner shaft	7.00
	266-262	1	Outer shaft	9.90
	350-11	1	Sealant	1.70
K2	490-5	1	Nut starter	.10
	597-260	1	Parts Order Form	
	597-308	1	Kit Builders Guide	
			Solder (Additional 6' rolls of solder, #331-13, can be ordered for 25 cents each.)	
		1	Manual (See front cover for part number.)	2.00

The prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from a Heathkit Electronic Center to cover local sales tax, postage and handling. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties and rates of exchange.

**NOTE:** Before you can operate this Metal Locator, it will be necessary to purchase a 9-volt battery. Use only the recommended battery types: Heath Company Model GDA-48-1, or a NEDA #1602 equivalent. Smaller batteries than these would have a shorter life, and a metal-cased battery could cause short circuits.

Recommended headphones, 2000  $\Omega$  Superex Model GD-396, may be purchased through the Heathkit Catalog.

## PARTS PICTORIAL (Continued)





## STEP-BY-STEP ASSEMBLY

Before you start to assemble this Kit, be sure to read the "Kit Builders Guide" for complete information on wiring, soldering, and step-by-step assembly procedures.

All resistors will be called out by their resistance value (in  $\Omega$ , or  $k\Omega$ ) and color code. Capacitors will be called out by their type and capacitance value (in pF, or  $\mu F$ ).

### CIRCUIT BOARDS

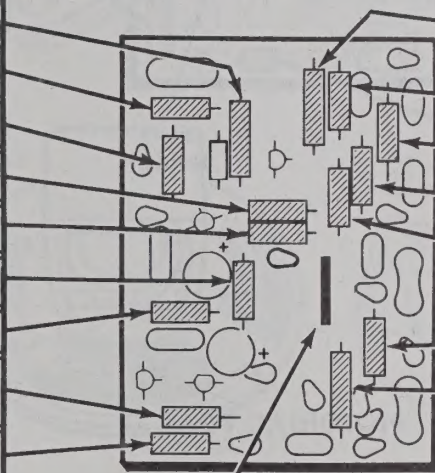
Components will be installed on the circuit boards in the following circuit board pictorials. Position all parts as shown. Follow the instructions carefully and read the entire step before performing the operation.

After completing each circuit board, check to make sure that all connections are soldered and that there are no solder bridges between adjacent foils. If you find a solder bridge, refer to the "Kit Builders Guide" for information on correcting it.

**START**



(✓) Position the search coil circuit board with the part number as shown in the Pictorial.
(✓) 2700 $\Omega$ , 5% (red-violet-red-gold).
(✓) 12 $k\Omega$ , 5% (brown-red-orange-gold).
(✓) 1000 $\Omega$ (brown-black-red).
(✓) 12 $k\Omega$ , 5% (brown-red-orange-gold).
(✓) 470 $\Omega$ (yellow-violet-brown).
(✓) 33 $\Omega$ (orange-orange-black).
(✓) 22 $k\Omega$ , 5% (red-red-orange-gold).
(✓) 100 $k\Omega$ , 5% (brown-black-yellow-gold).
(✓) 18 $k\Omega$ (brown-gray-orange).
(✓) Solder all leads to the foil and cut off the excess lead lengths.



PART  
NUMBER

**CONTINUE**



(✓) 150 $\Omega$ , 5% (brown-green-brown-gold).
(✓) 12 $k\Omega$ , 5% (brown-red-orange-gold).
(✓) 1000 $\Omega$ (brown-black-red).
(✓) 1000 $\Omega$ (brown-black-red).
(✓) 100 $k\Omega$ , 5% (brown-black-yellow-gold).
(✓) 12 $k\Omega$ , 5% (brown-red-orange-gold).
(✓) 9100 $\Omega$ , 5% (white-brown-red-gold).
(✓) Solder all leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-1



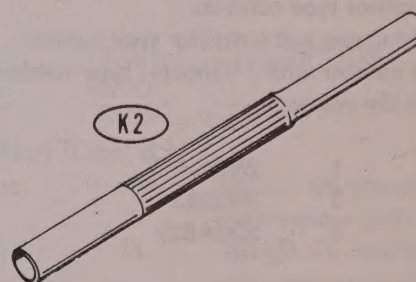
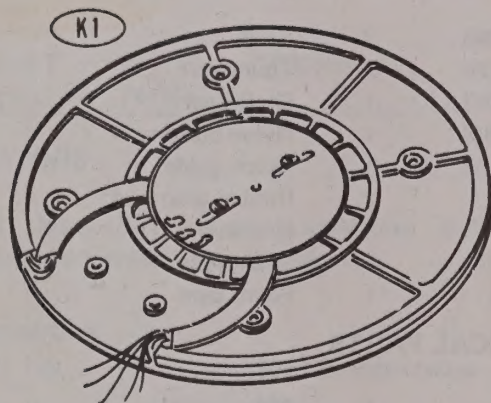
KEY PART No.	KEY PART No.	PARTS Per Kit	DESCRIPTION	PRICE Each
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	85-1180-2	1	Audio circuit board	.95
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K1	100-1098	1	Search coil	13.75
	266-261	1	Inner shaft	7.00
	266-262	1	Outer shaft	9.90
	350-11	1	Sealant	1.70
K2	490-5	1	Nut starter	.10
	597-260	1	Parts Order Form	
	597-308	1	Kit Builders Guide	
			Solder (Additional 6' rolls of solder, #331-13, can be ordered for 25 cents each.)	
		1	Manual (See front cover for part number.)	2.00

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## PARTS PICTORIAL (Continued)





## STEP-BY-STEP ASSEMBLY

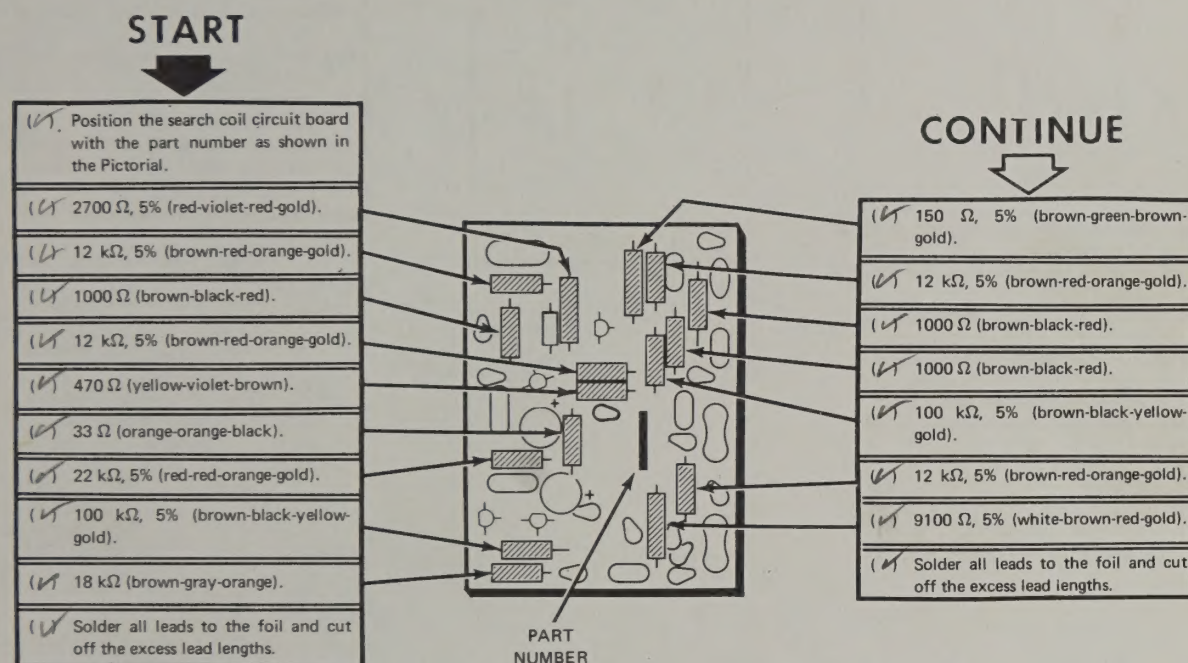
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## CIRCUIT BOARDS

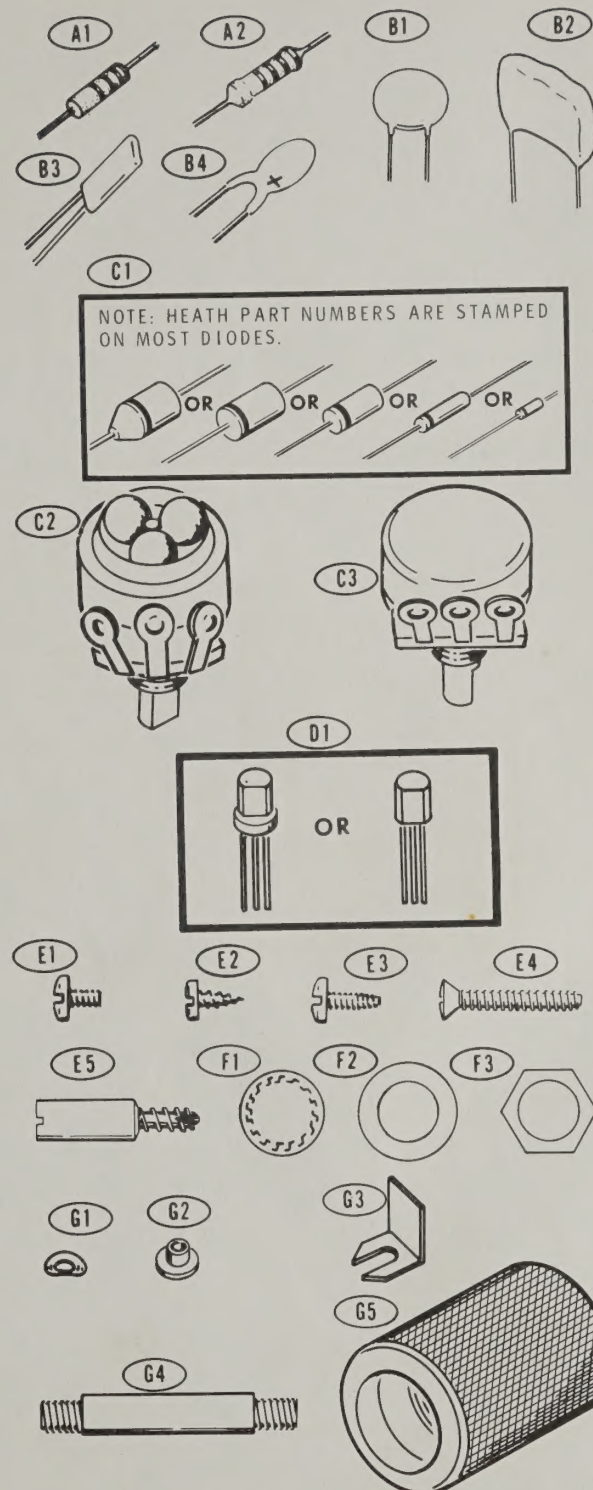
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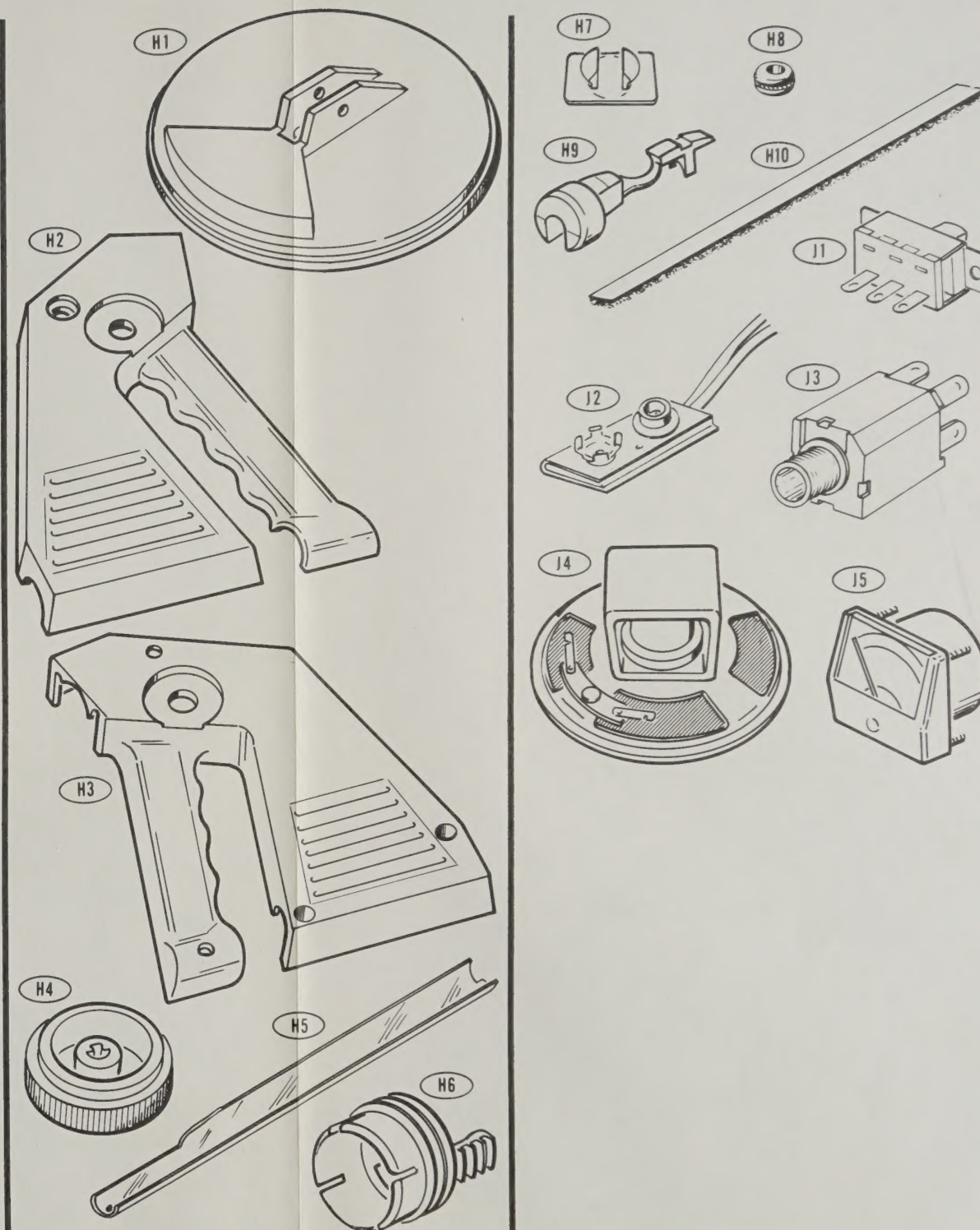
After completing each circuit board, check to make sure that all connections are soldered and that there are no solder bridges between adjacent foils. If you find a solder bridge, refer to the "Kit Builders Guide" for information on correcting it.



## PICTORIAL 1-1

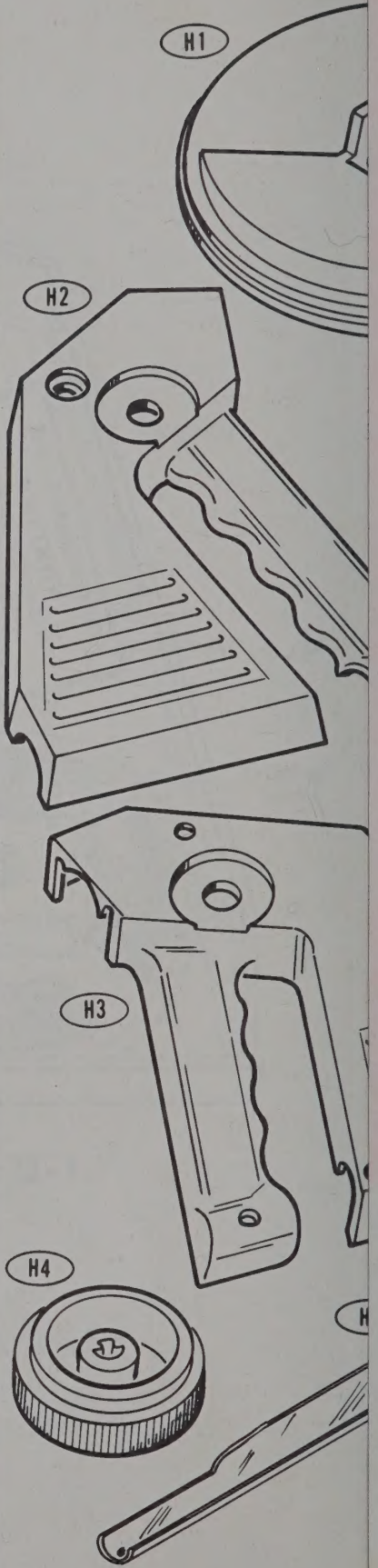
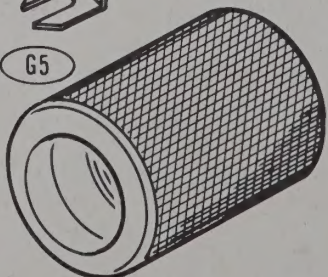
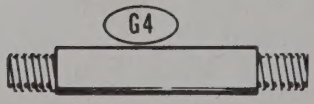
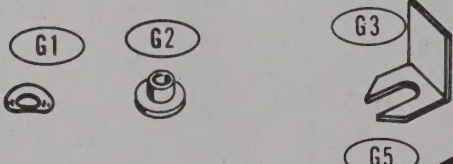
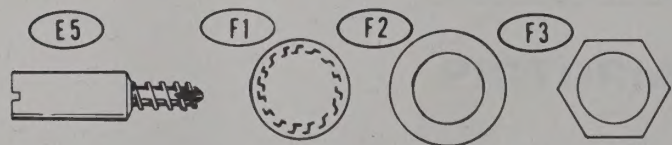
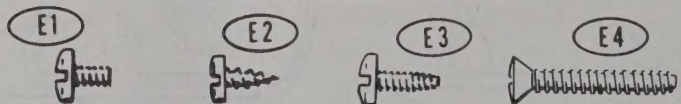
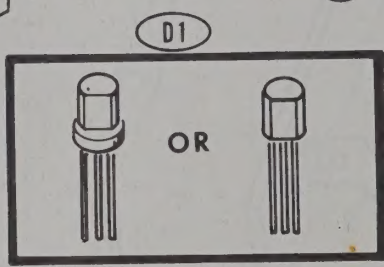
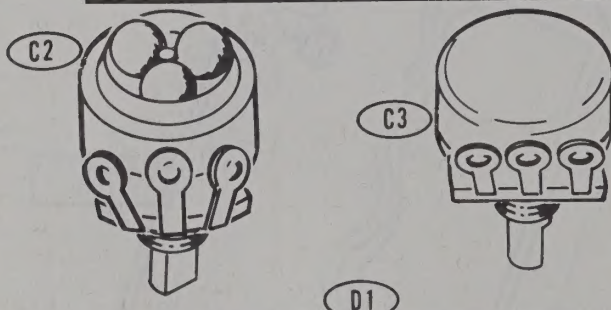
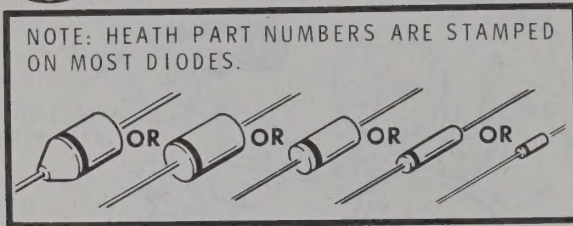
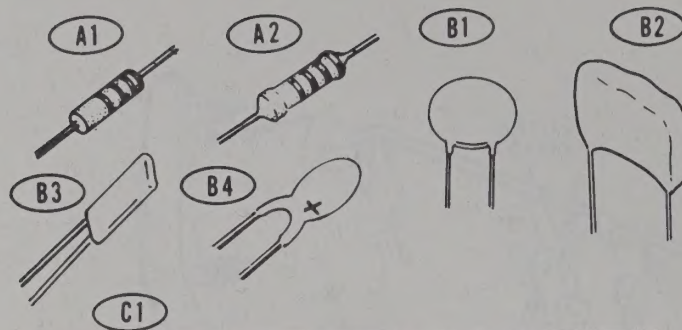


## PARTS PICTORIAL





# PARTS PICTO



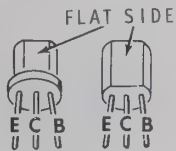


# START

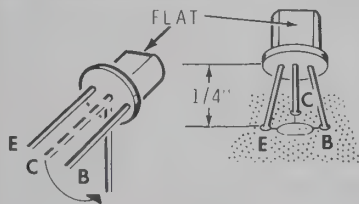


NOTE: In the following steps, install the transistors as follows:

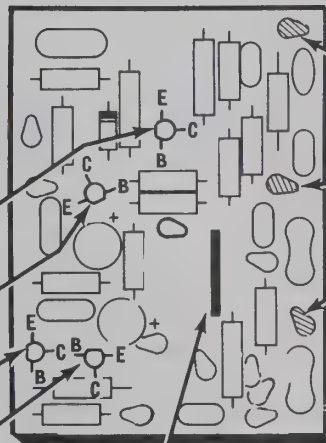
1. The transistor supplied with your kit may not have a skirt as shown. Refer to the illustration below and identify the E, C, and B leads of the transistor.



2. Insert the transistor leads into the corresponding E, C, and B holes in the circuit board.
3. Position the transistor 1/4" above the circuit board.
4. Turn the circuit board over, solder the leads to the foil, and cut off the excess lead lengths.



- (✓) 2N3393 transistor (#417-118) at Q103.
- (✓) X29A829 transistor (#417-201) at Q104.
- (✓) X29A829 transistor (#417-201) at Q101.
- (✓) 2N3416 transistor (#417-94) at Q102.



PART  
NUMBER

# CONTINUE



NOTE: To prepare a wire, cut the wire to the indicated length and then remove 1/4" of insulation from each end.

- (✓) Prepare the following lengths of white wire:

2-1/4"  
2-1/4"  
2-1/4"

NOTE: In the following steps, install each wire as it is called for by inserting one end into the indicated hole. (The free end will be connected later.) Turn the circuit board over and solder the wire to the foil. Then cut off the excess lead length extending from the bottom of the circuit board.

- (✓) 2-1/4" wire at J.

- (✓) 2-1/4" wire at K.

- (✓) 2-1/4" wire at H.

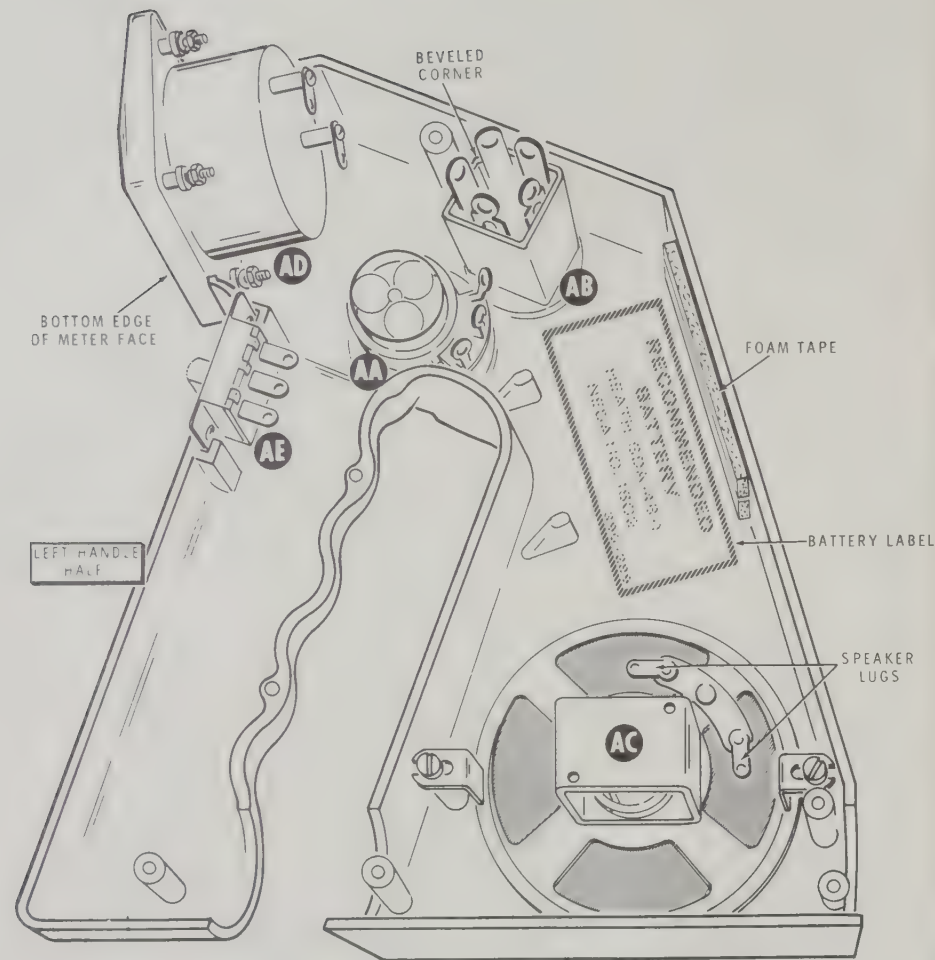
- (✓) Set the completed circuit board aside until it is called for in a step.

# FINISH

PICTORIAL 1-3



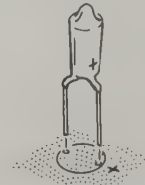




PICTORIAL 3-1


START

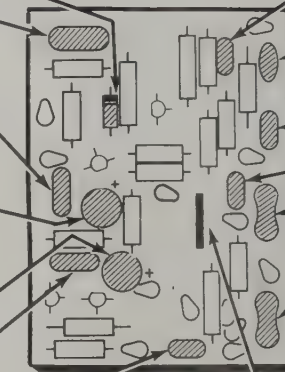


<input checked="" type="checkbox"/> 1N4149 diode (#56-56).
<input checked="" type="checkbox"/> .1 $\mu$ F Mylar.
<input checked="" type="checkbox"/> .022 $\mu$ F Mylar.
<input checked="" type="checkbox"/> 33 $\mu$ F tantalum. Be sure to position the positive (+) mark as shown.

<input checked="" type="checkbox"/> 33 $\mu$ F tantalum.
<input checked="" type="checkbox"/> .047 $\mu$ F Mylar.
<input checked="" type="checkbox"/> .01 $\mu$ F Mylar.
<input checked="" type="checkbox"/> Solder all leads to the foil and cut off the excess lead lengths.

CONTINUE



<input checked="" type="checkbox"/> .0033 pF Mylar (3300).
<input checked="" type="checkbox"/> 820 pF ceramic.
REMOVE INSULATION ON LEADS 
<input checked="" type="checkbox"/> .01 $\mu$ F Mylar.
<input checked="" type="checkbox"/> .01 $\mu$ F Mylar.
<input checked="" type="checkbox"/> 1800 pF mica.
<input checked="" type="checkbox"/> 3300 pF mica.
<input type="checkbox"/> Solder all leads to the foil and cut off the excess lead lengths.



PART NUMBER

PICTORIAL 1-2

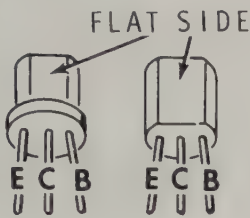


# START

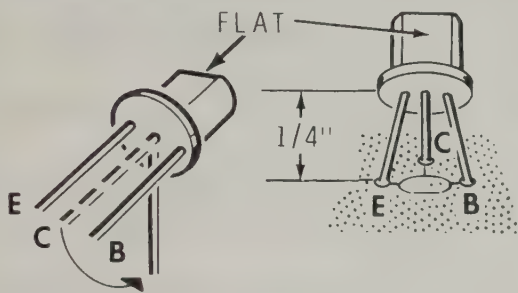


NOTE: In the following steps, install the transistors as follows:

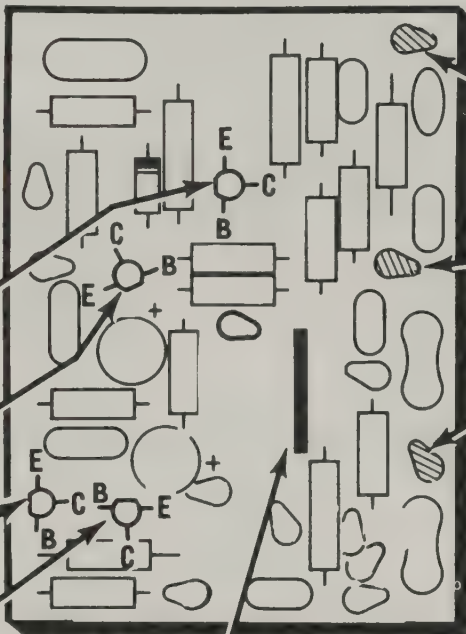
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- (✓) X29A829 transistor (#417-201) at Q104.
- (✓) X29A829 transistor (#417-201) at Q101.
- (✓) 2N3416 transistor (#417-94) at Q102.



PART  
NUMBER

# CONTINUE



NOTE: To prepare a wire, cut the wire to the indicated length and then remove 1/4" of insulation from each end.

- (✓) Prepare the following lengths of white wire:

2-1/4"  
2-1/4"  
2-1/4"

NOTE: In the following steps, install each wire as it is called for by inserting one end into the indicated hole. (The free end will be connected later.) Turn the circuit board over and solder the wire to the foil. Then cut off the excess lead length extending from the bottom of the circuit board.

- (✓) 2-1/4" wire at J.
- (✓) 2-1/4" wire at K.
- (✓) 2-1/4" wire at H.

- (✓) Set the completed circuit board aside until it is called for in a step.

# FINISH

PICTORIAL 1-3





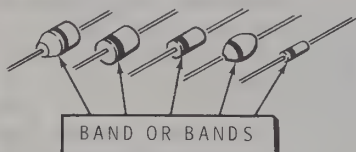
## START



- (✓) Position the audio circuit board with the part number as shown in the Pictorial.

- (✓) 1N4149 diode (#56-56).

NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. ALWAYS POSITION THE BANDED END AS SHOWN ON THE CIRCUIT BOARD.



- (✓) 1N4149 diode (#56-56).

- (✓) 12 k $\Omega$ , 5% (brown-red-orange-gold).

- (✓) MZ500-10 zener diode (#56-63).

- (✓) 9100  $\Omega$ , 5% (white-brown-red-gold).

- (✓) 68 k $\Omega$  (blue-gray-orange).

- (✓) 18 k $\Omega$  (brown-gray-orange).

- (✓) Solder all leads to the foil and cut off the excess lead lengths.

## CONTINUE



- (✓) 150  $\Omega$ , 5% (brown-green-brown-gold).

- (✓) 390 k $\Omega$ , 5% (orange-white-yellow-gold).

- (✓) 6800  $\Omega$ , 5% (blue-gray-red-gold).

- (✓) 2400  $\Omega$ , 5% (red-yellow-red-gold).

- (✓) 1000  $\Omega$  (brown-black-red).

- (✓) 470  $\Omega$  (yellow-violet-brown).

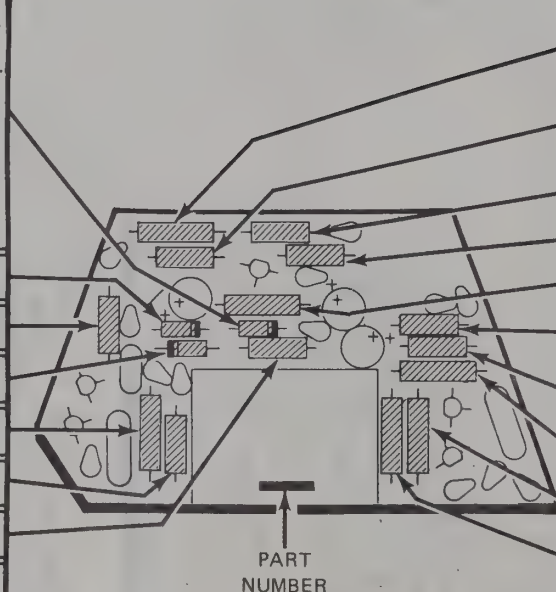
- (✓) 100 k $\Omega$ , 5% (brown-black-yellow-gold).

- (✓) 9100  $\Omega$ , 5% (white-brown-red-gold).

- (✓) 2700  $\Omega$ , 5% (red-violet-red-gold).

- ( ) 560  $\Omega$ , 5% (green-blue-brown-gold).

- ( ) Solder all leads to the foil and cut off the excess lead lengths.



PICTORIAL 2-1

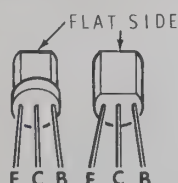


# START

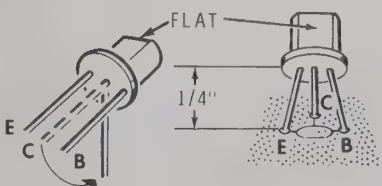


NOTE: In the following steps, install the transistors as follows:

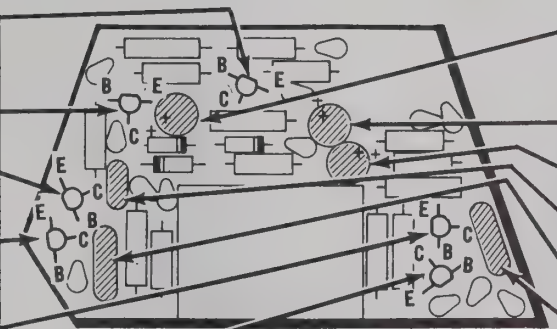
1. The transistor supplied with your kit may not have a skirt as shown. Refer to the illustration below and identify the E, C, and B leads of the transistor.



2. Insert the transistor leads into the corresponding E, C, and B holes in the circuit board.
3. Position the transistor 1/4" above the circuit board.
4. Turn the circuit board over, solder the leads to the foil, and cut off the excess lead lengths.



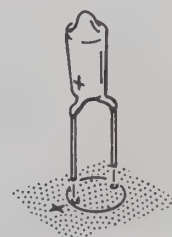
- (✓) X29A829 transistor (#417-201) at Q206.
- (✓) 2N3393 transistor (#417-118) at Q205.
- (✓) X29A829 transistor (#417-201) at Q204.
- (✓) X29A829 transistor (#417-201) at Q203.
- (✓) X29A829 transistor (#417-201) at Q202.
- (✓) 2N3393 transistor (#417-118) at Q201.



# CONTINUE



- (✓) 33  $\mu$ F tantalum. Be sure to position the positive (+) mark as shown.



- (✓) 33  $\mu$ F tantalum.
- (✓) 33  $\mu$ F tantalum.
- (✓) .01  $\mu$ F Mylar.
- (✓) .1  $\mu$ F Mylar.
- (✓) .1  $\mu$ F Mylar.
- (✓) Solder all leads to the foil and cut off the excess lead lengths.

PICTORIAL 2-2



# START



- (✓) Refer to Detail 2-3A and prepare a 10" length of 8-wire cable.

Connect the wires from the 8-wire cable to the audio circuit board (#85-1180-2) in the following steps. Insert the bare end of each wire through its hole from the component side of the circuit board. Then solder the wire on the foil side of the board.

- (✓) Orange wire to N (S-1).

- (✓) Red wire to P (S-1).

- (✓) Brown wire to H (S-1).

- (✓) Black wire to T (S-1).

- (✓) Green wire to S (S-1).

- (✓) Yellow wire to L (S-1).

- (✓) White wire to U (S-1).

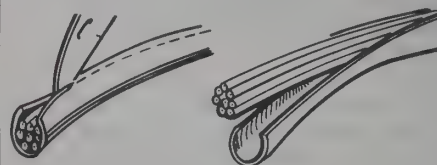
- (✓) Blue wire to J (S-1).

- (i) Carefully twist the wires just installed for a length of 2-1/4" as shown. This will hold the wires together for later steps.

- (✓) Set the completed circuit board aside until it is called for in a step.

# FINISH

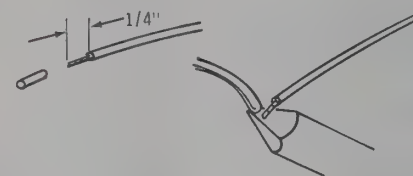
TAKING CARE NOT TO CUT THE INNER WIRES, REMOVE ALL THE OUTER INSULATION FROM THE EIGHT WIRE CABLE.



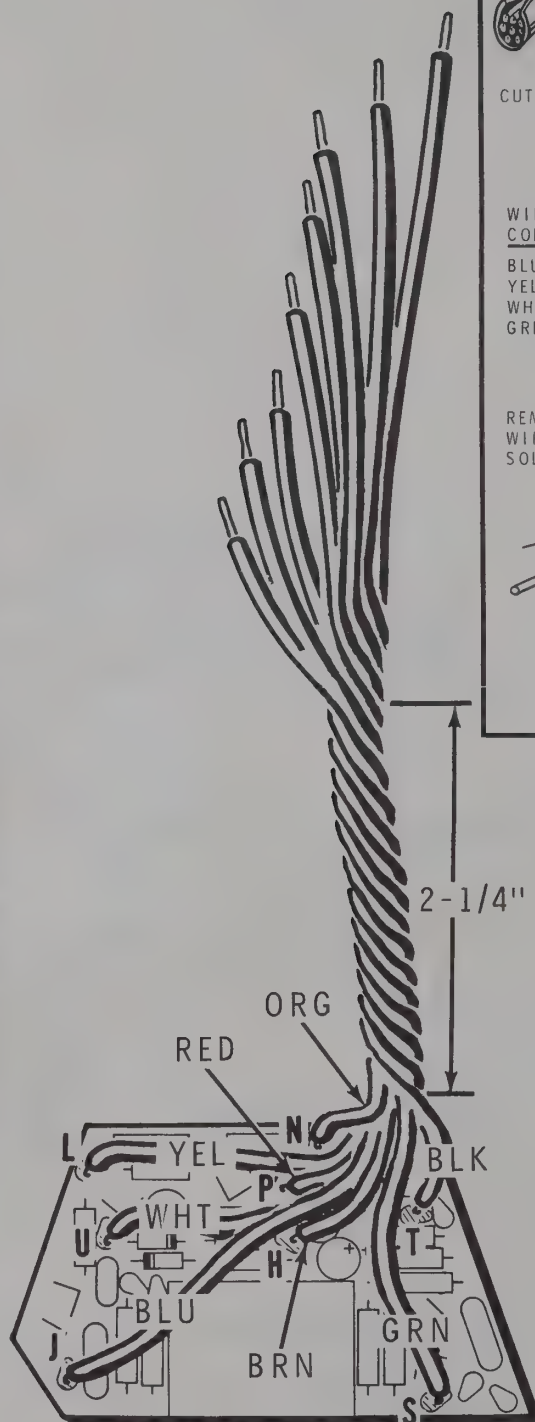
CUT EACH WIRE TO THE FOLLOWING LENGTH.

WIRE COLOR	LENGTH	WIRE COLOR	LENGTH
BLUE	7-1/4"	RED	6-1/4"
YELLOW	6-1/2"	BROWN	5"
WHITE	6-1/2"	BLACK	8"
GREEN	9-1/2"	ORANGE	7"

REMOVE 1/4" OF INSULATION FROM THE WIRES. THEN APPLY A SMALL AMOUNT OF SOLDER TO THE BARE WIRE ENDS.



Detail 2-3A



PICTORIAL 2-3

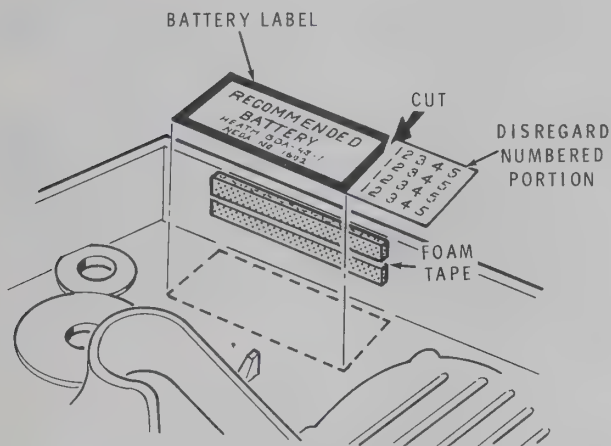




## HANDLE ASSEMBLY AND WIRING

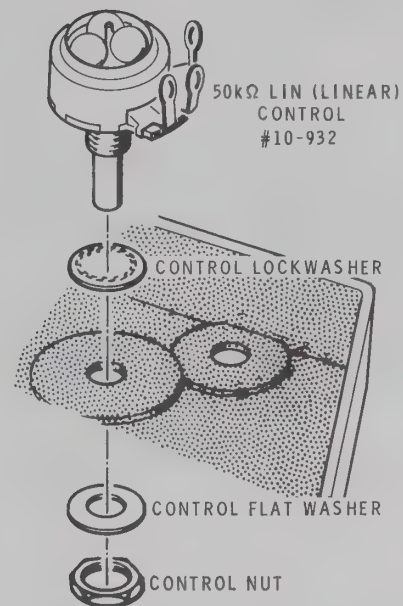
Refer to Pictorial 3-1 (fold-out from Page 6) for the following steps.

- ( ) Place a soft cloth on your work surface to protect the handle halves and parts during assembly.
- ( ) Locate the left handle half and position it on your work surface as shown.

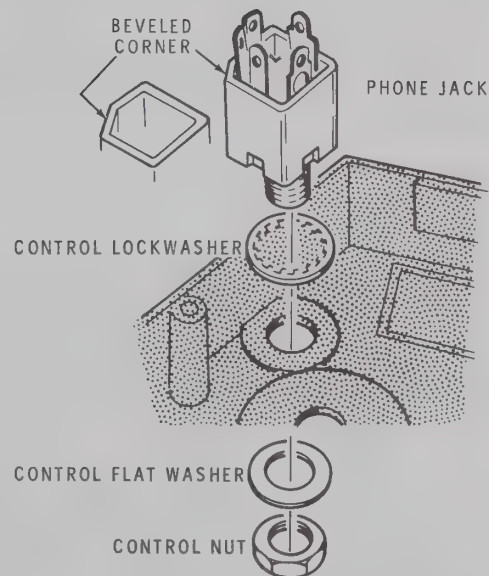


Detail 3-1A

- (✓) Cut the length of foam tape into three 2" lengths.
- (✓) Peel off the protective backing paper from two lengths of the foam tape. Then press these two foam tapes into the approximate positions shown in the left handle half as shown in Detail 3-1A.
- (✓) Again refer to the Detail and cut off and discard the numbered portion of the battery label. Then peel off the protective backing and press the label into position in the left handle half.
- (✓) Refer to Detail 3-1B and mount the 50 k $\Omega$  LIN (linear) control (#10-932) at AA in the left handle half. Use a control lockwasher, control flat washer, and control nut. Be sure to position the control as shown.
- (✓) Mount the phone jack in the left handle half at AB with a control lockwasher, control flat washer, and control nut as shown in Detail 3-1C. Be sure to position the beveled corner as shown.

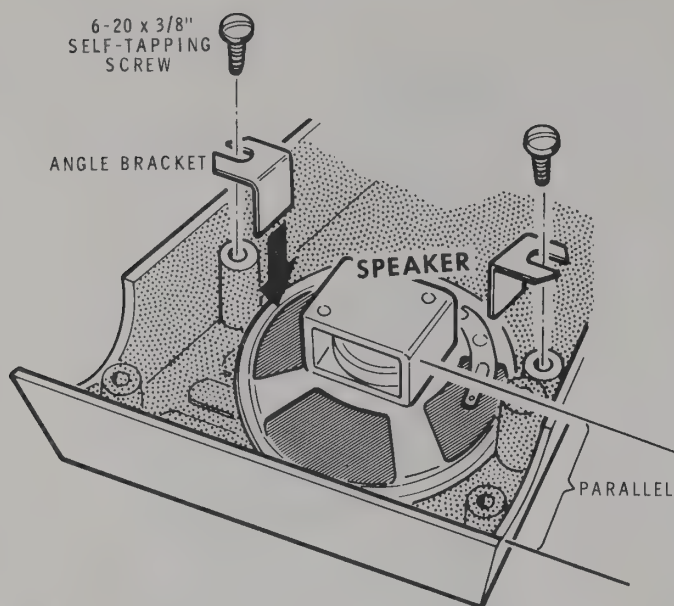


Detail 3-1B



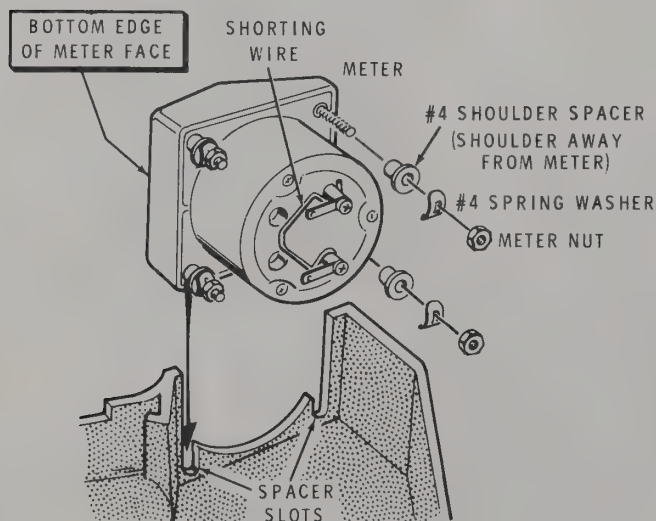
Detail 3-1C





Detail 3-1D

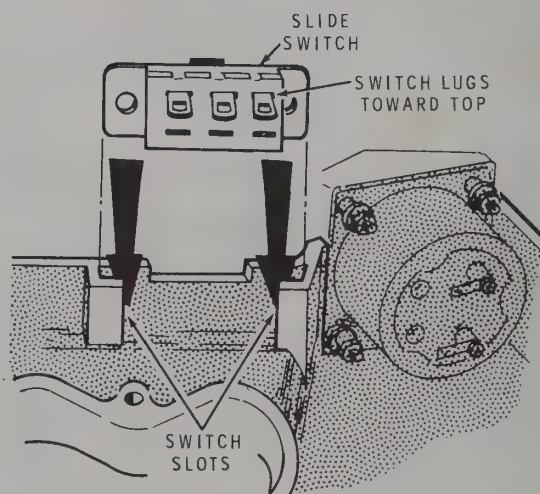
- (✓) Place the speaker in the left handle half at AC as shown in Detail 3-1D. Then mount the speaker with angle brackets and 6-20 x 3/8" self-tapping screws while turning the speaker until the lugs are positioned as shown. The speaker magnet should be parallel with the indicated edge of the handle half. Be careful you do not puncture the paper cone of the speaker.
- (✓) Locate the meter and the hardware packed with it. Keep the meter nuts and discard the remaining hardware.



Detail 3-1E

NOTE: Use the plastic nut starter supplied with this kit to pickup and start nuts on the meter mounting studs.

- (✓) Refer to Detail 3-1E and place a #4 shoulder spacer, a #4 spring washer, and a meter nut on each of the four meter studs. The shoulder on the #4 shoulder spacer should be away from the meter as shown. NOTE: Tighten the meter nut until it just touches the #4 spring washer.
- (✓) Remove and discard the shorting wire from the meter lugs.
- (✓) Again refer to the Detail and install the meter on the left handle half at AD by sliding two of the #4 shoulder spacers into the spacer slots. NOTE: When the meter is installed, the bottom edge of the meter face should be positioned as indicated and the #4 spring washers should be almost completely flattened.



Detail 3-1F

- (✓) Place the slide switch in the switch slots at AE in the left handle half as shown in Detail 3-1F. The switch lugs should be toward the top of the switch.

NOTE: To prepare a wire, as in the following step, cut it to the proper length and remove 1/4" of insulation from each end.



Refer to Detail 3-2A (fold-out from Page 13) for the following steps.

- (✓) Prepare the following lengths of white hookup wire:

8"	4-1/4"
8"	4-1/4"

- (✓) Connect one end of an 8" white hookup wire to lug 1 of speaker AC (S-1). The other end will be connected later.

- (✓) Connect one end of the other 8" white hookup wire to lug 2 of speaker AC (S-1). The other end will be connected later.

- (✓) Twist together the two 8" white hookup wires coming from the speaker to form a twisted pair. The last 2" of the wires at the free end should not be twisted. Then position the twisted wires up to the phone jack lugs as shown.

- (✓) Connect one of these twisted wires to lug 5 of phone jack AB (NS).

- (✓) Connect the remaining twisted wire to lug 3 of phone jack AB (NS).

- (✓) Connect one end of a 4-1/4" white hookup wire from lug 3 of phone jack AB (NS) to lug 1 of slide switch AE (NS).

- (✓) Connect one end of the remaining 4-1/4" white hookup wire from lug 3 of phone jack AB (S-3) to the positive (+) lug of meter AD (S-1).

Refer to Pictorial 3-2 (fold-out from Page 13) for the following steps.

- (✓) Position the previously assembled audio circuit board on the left handle half as shown.

- (✓) Remove additional insulation from the free ends of wires in the twisted group as follows:

WIRE	REMOVE
green	an additional 1/4"
blue	an additional 1/4"
white	an additional 1/2"

NOTE: When a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the soldering instructions (S-2), one entering and one leaving the connection.

Connect the wires from the 8-wire cable as follows:

- (✓) Blue wire through lug 2 (S-2) to lug 1 (S-1) of control AA.

- (✓) Brown wire to lug 3 of control AA (S-1).

- (✓) Yellow wire to lug 5 of phone jack AB (S-2).

- (✓) White wire through lug 1 (S-2) to lug 4 (S-1) of phone jack AB.

- (✓) Orange wire to the negative (−) lug of meter AD (S-1).

- (✓) Red wire to lug 1 of slide switch AE (S-2).

NOTE: The black wire and green wire will be connected later.

- (✓) Locate the battery connector and cut the red wire to a 4" length. Then remove 1/4" of insulation.

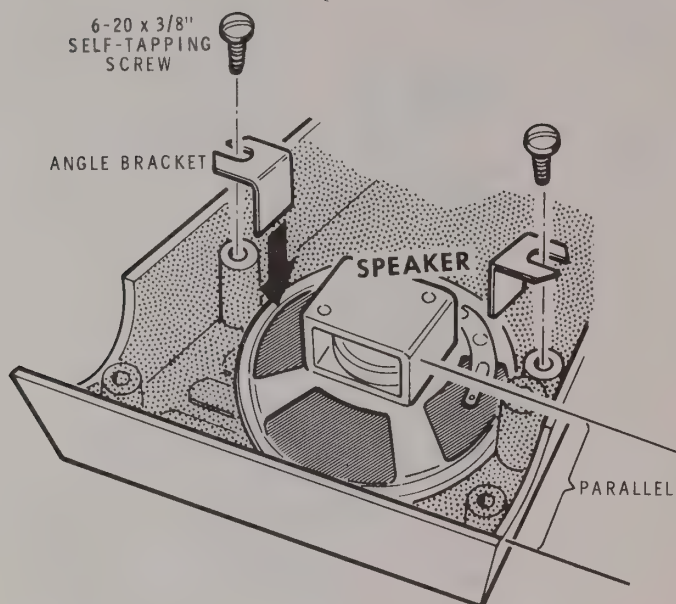
- (✓) Connect the red wire from the battery connector to lug 2 of slide switch AE (S-1).

- (✓) Place the slide switch AE in its off position (away from meter). Insert the black battery connector wire into hole K (from the component side) on the audio circuit board. Then turn the circuit board over and solder the wire to the foil (S-1). Cut off any excess wire length.

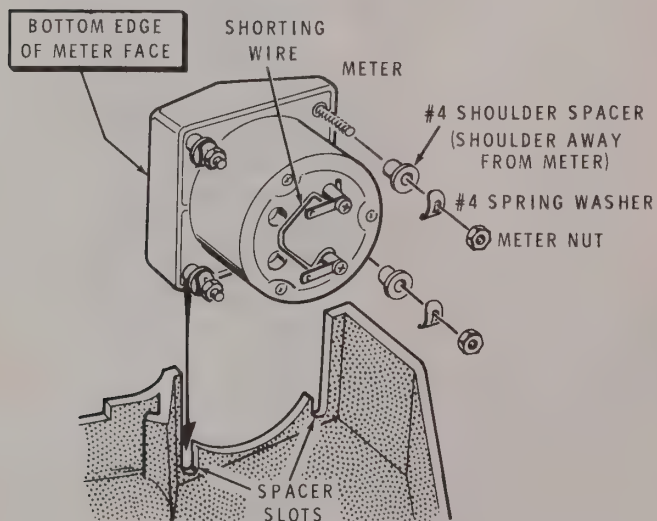
- (✓) Temporarily set the left handle half aside until it is called for later.





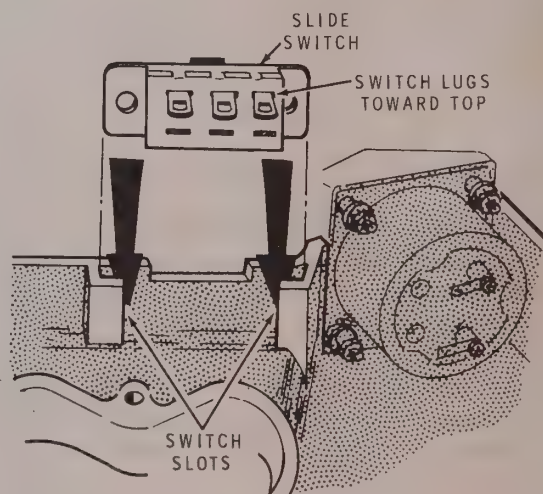
**Detail 3-1D**

- (✓) Place the speaker in the left handle half at AC as shown in Detail 3-1D. Then mount the speaker with angle brackets and 6-20 x 3/8" self-tapping screws while turning the speaker until the lugs are positioned as shown. The speaker magnet should be parallel with the indicated edge of the handle half. Be careful you do not puncture the paper cone of the speaker.
- (✓) Locate the meter and the hardware packed with it. Keep the meter nuts and discard the remaining hardware.

**Detail 3-1E**

**NOTE:** Use the plastic nut starter supplied with this kit to pickup and start nuts on the meter mounting studs.

- (✓) Refer to Detail 3-1E and place a #4 shoulder spacer, a #4 spring washer, and a meter nut on each of the four meter studs. The shoulder on the #4 shoulder spacer should be away from the meter as shown. **NOTE:** Tighten the meter nut until it just touches the #4 spring washer.
- (✓) Remove and discard the shorting wire from the meter lugs.
- (✓) Again refer to the Detail and install the meter on the left handle half at AD by sliding two of the #4 shoulder spacers into the spacer slots. **NOTE:** When the meter is installed, the bottom edge of the meter face should be positioned as indicated and the #4 spring washers should be almost completely flattened.

**Detail 3-1F**

- (✓) Place the slide switch in the switch slots at AE in the left handle half as shown in Detail 3-1F. The switch lugs should be toward the top of the switch.

**NOTE:** To prepare a wire, as in the following step, cut it to the proper length and remove 1/4" of insulation from each end.

Refer to Detail 3-2A (fold-out from Page 13) for the following steps.

(✓) Prepare the following lengths of white hookup wire:

8"	4-1/4"
8"	4-1/4"

- (✓) Connect one end of an 8" white hookup wire to lug 1 of speaker AC (S-1). The other end will be connected later.
- (✓) Connect one end of the other 8" white hookup wire to lug 2 of speaker AC (S-1). The other end will be connected later.
- (✓) Twist together the two 8" white hookup wires coming from the speaker to form a twisted pair. The last 2" of the wires at the free end should not be twisted. Then position the twisted wires up to the phone jack lugs as shown.
- (✓) Connect one of these twisted wires to lug 5 of phone jack AB (NS).
- (✓) Connect the remaining twisted wire to lug 3 of phone jack AB (NS).
- (✓) Connect one end of a 4-1/4" white hookup wire from lug 3 of phone jack AB (NS) to lug 1 of slide switch AE (NS).
- (✓) Connect one end of the remaining 4-1/4" white hookup wire from lug 3 of phone jack AB (S-3) to the positive (+) lug of meter AD (S-1).

Refer to Pictorial 3-2 (fold-out from Page 13) for the following steps.

- (✓) Position the previously assembled audio circuit board on the left handle half as shown.
- (✓) Remove additional insulation from the free ends of wires in the twisted group as follows:

WIRE	REMOVE
green	an additional 1/4"
blue	an additional 1/4"
white	an additional 1/2"

NOTE: When a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the soldering instructions (S-2), one entering and one leaving the connection.

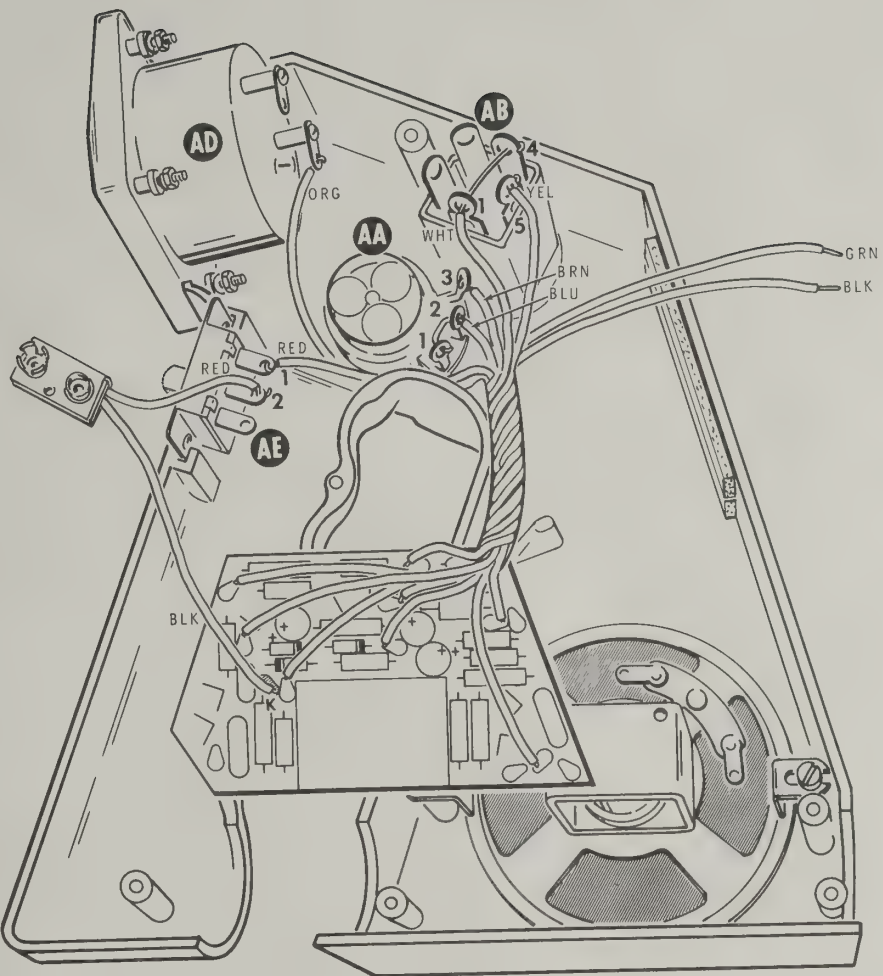
Connect the wires from the 8-wire cable as follows:

- (✓) Blue wire through lug 2 (S-2) to lug 1 (S-1) of control AA.
- (✓) Brown wire to lug 3 of control AA (S-1).
- (✓) Yellow wire to lug 5 of phone jack AB (S-2).
- (✓) White wire through lug 1 (S-2) to lug 4 (S-1) of phone jack AB.
- (✓) Orange wire to the negative (-) lug of meter AD (S-1).
- (✓) Red wire to lug 1 of slide switch AE (S-2).

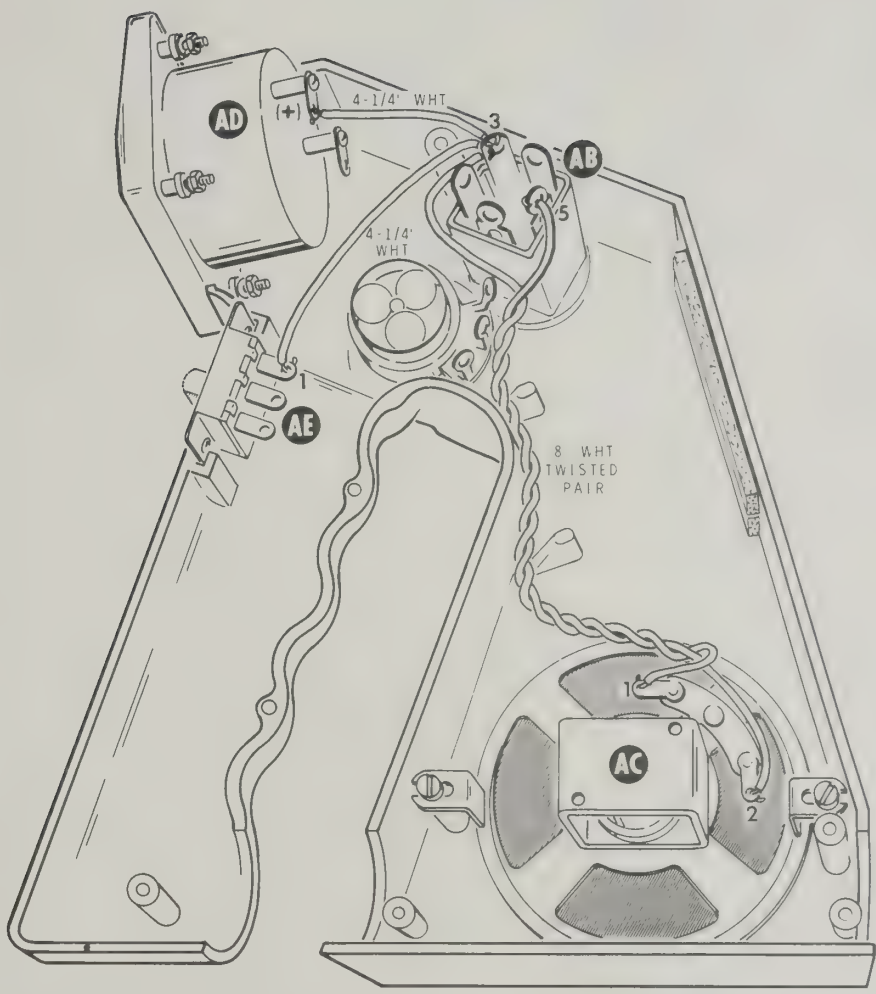
NOTE: The black wire and green wire will be connected later.

- (✓) Locate the battery connector and cut the red wire to a 4" length. Then remove 1/4" of insulation.
- (✓) Connect the red wire from the battery connector to lug 2 of slide switch AE (S-1).
- (✓) Place the slide switch AE in its off position (away from meter). Insert the black battery connector wire into hole K (from the component side) on the audio circuit board. Then turn the circuit board over and solder the wire to the foil (S-1). Cut off any excess wire length.

- (✓) Temporarily set the left handle half aside until it is called for later.



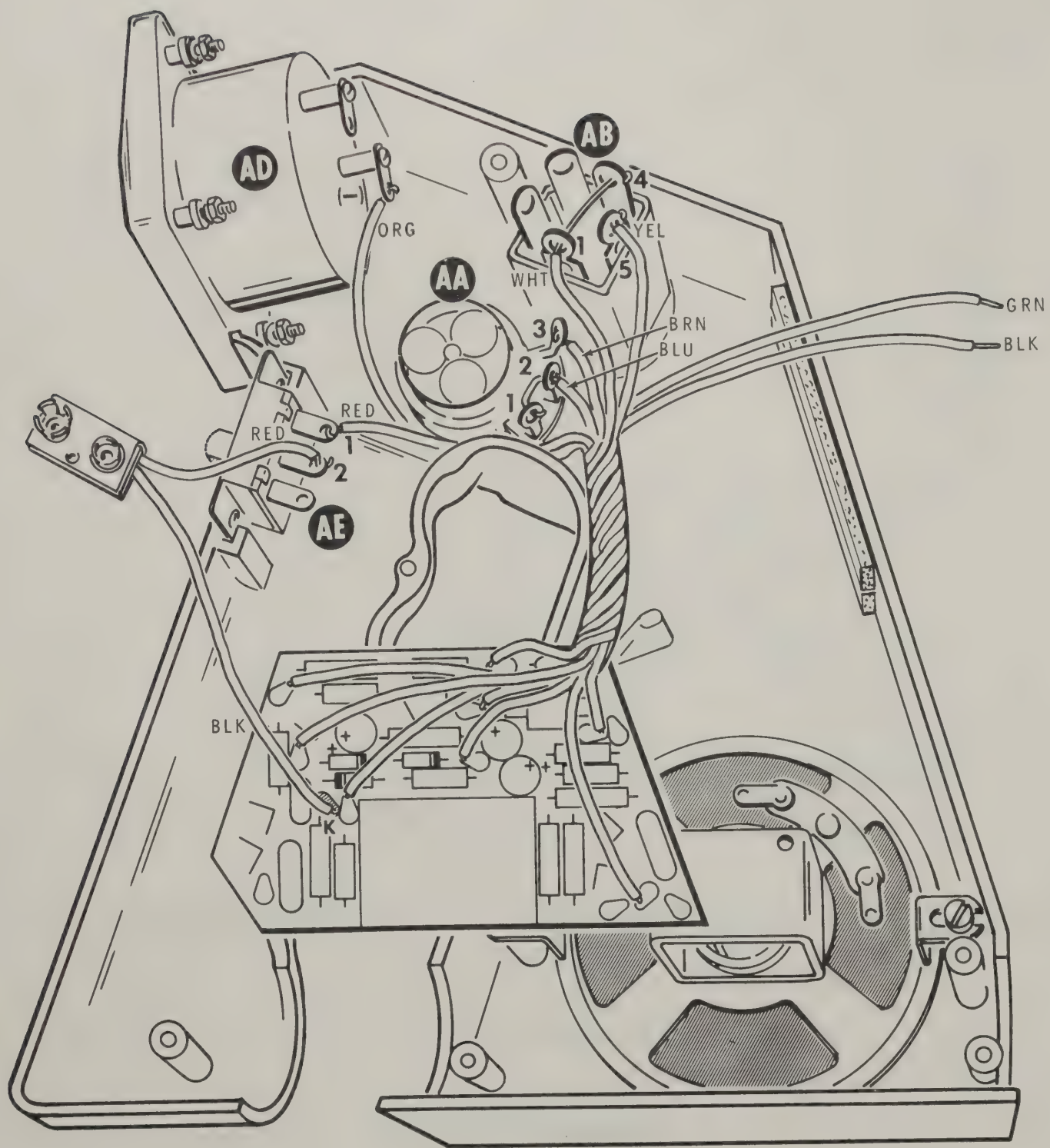
PICTORIAL 3-2



Detail 3-2A

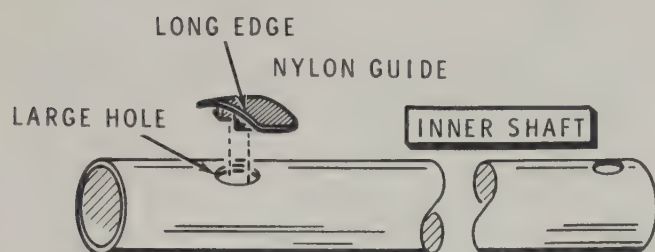






**PICTORIAL 3-2**

- (✓) Install the nylon bushing on the end of the outer shaft as shown in Detail 3-3B. As the bushing is installed, make sure the liner tab seats in the bushing groove and the bushing tabs seat in the indicated outer shaft holes.



Detail 3-3C

- (✓) Refer to Detail 3-3C and install the nylon guide in the large hole at the large-hole end of the inner shaft. First snap one of its locking tabs in the hole, and then the other locking tab. NOTE: The long edge of the guide should be parallel with the end of the inner shaft.

- (✓) Refer to Detail 3-3D and insert the end of the inner shaft opposite the nylon guide into the four-hole end of the outer shaft. Line the nylon guide up with the four holes while you push the two shafts together.

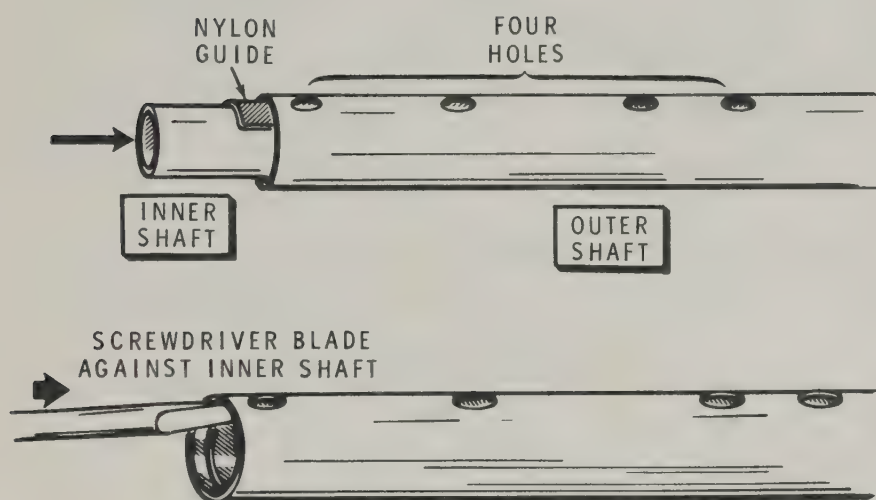
- (✓) Then use a 4", or longer, screwdriver blade to push the inner shaft into the outer shaft, as shown. The other end of the inner shaft should then protrude from the nylon bushing. Be sure to place the screwdriver blade against the inner shaft exactly in the position shown so the shaft liner does not move or get pushed out of the shaft.

- (✓) Insert the screwdriver blade through the small holes in the end of the inner shaft as shown in Detail 3-3E. Then hold the nylon bushing while gradually pulling the inner shaft out to a length of 3" from the nylon bushing. Remove the screwdriver from the inner shaft.

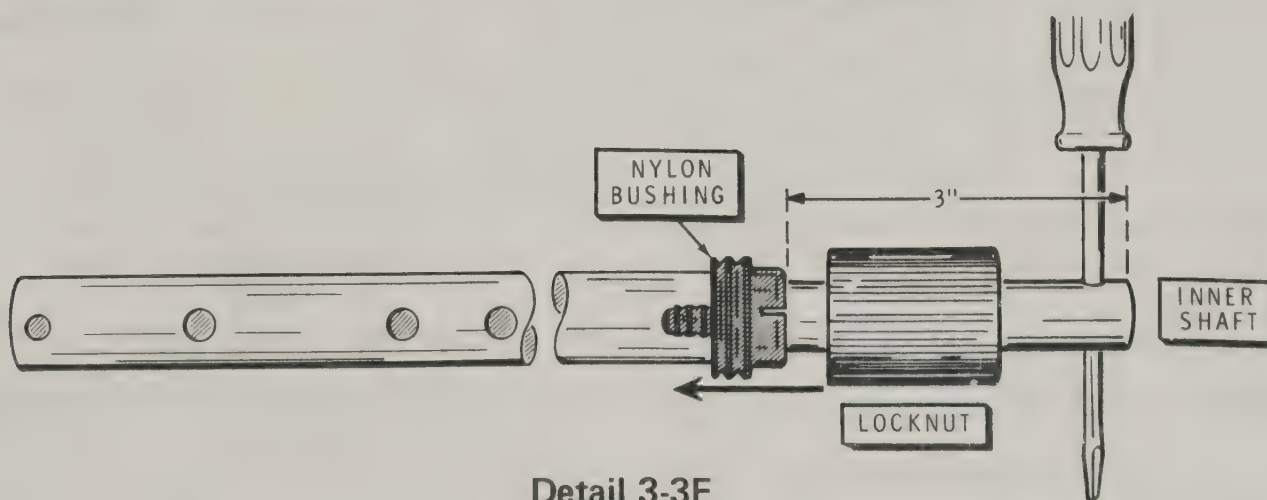
- (✓) Place the locknut on the inner shaft with the threaded portion toward the nylon bushing. Tighten the locknut finger tight on the nylon bushing.

- (✓) Be sure the hole in the shaft liner is in line with the hole in the outer shaft. You may have to use a pencil point to realign the holes.

- (✓) Place the four-hole end of the outer shaft in the left handle half. The four holes should be facing up. Then mount the outer shaft with a #6 x 1" self-tapping screw at AG. Be sure to use the correct screw as shown in the Pictorial.



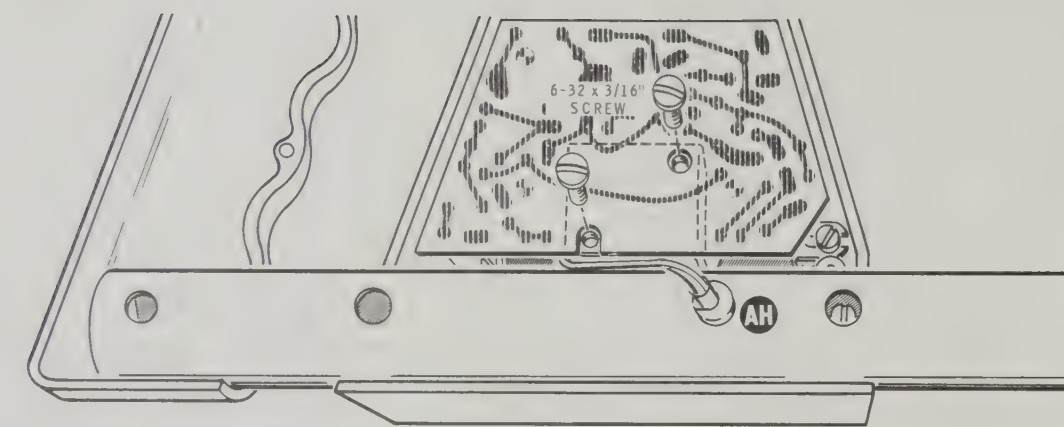
Detail 3-3D



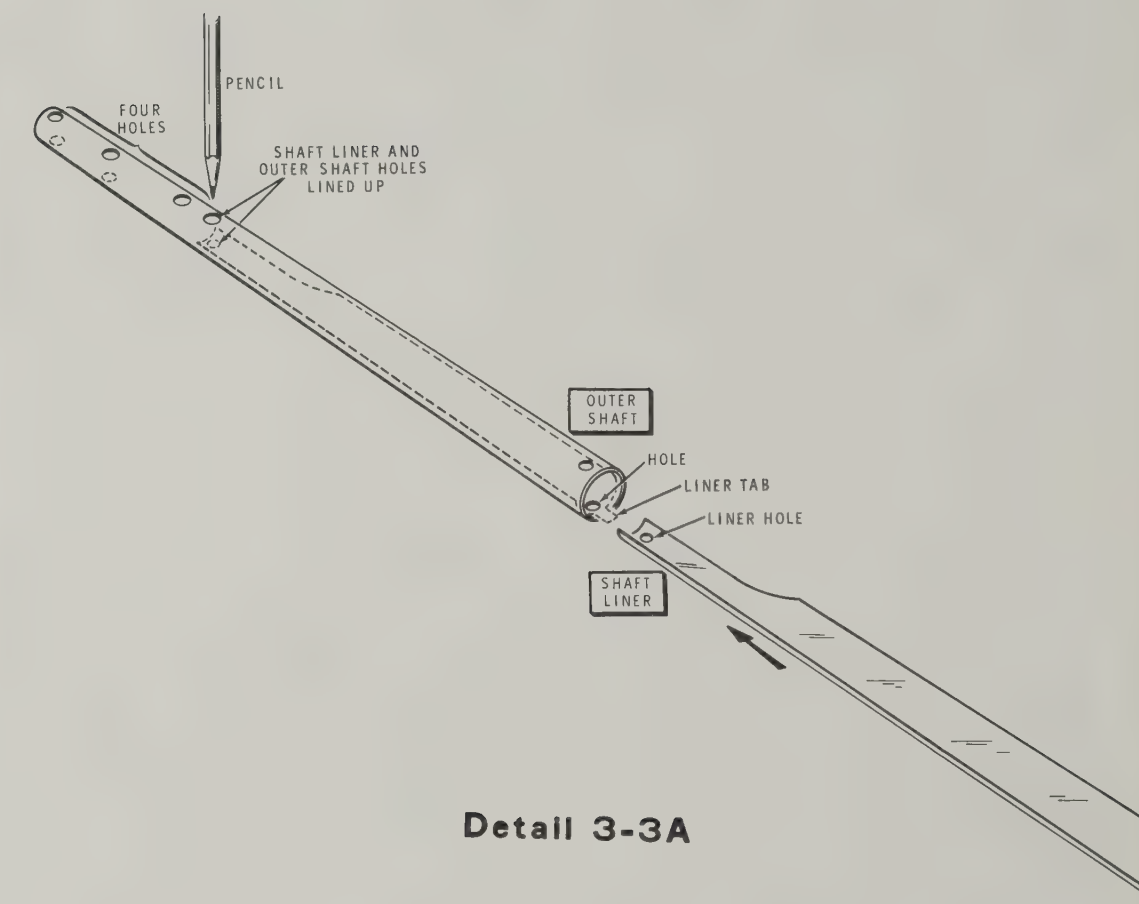
Detail 3-3E



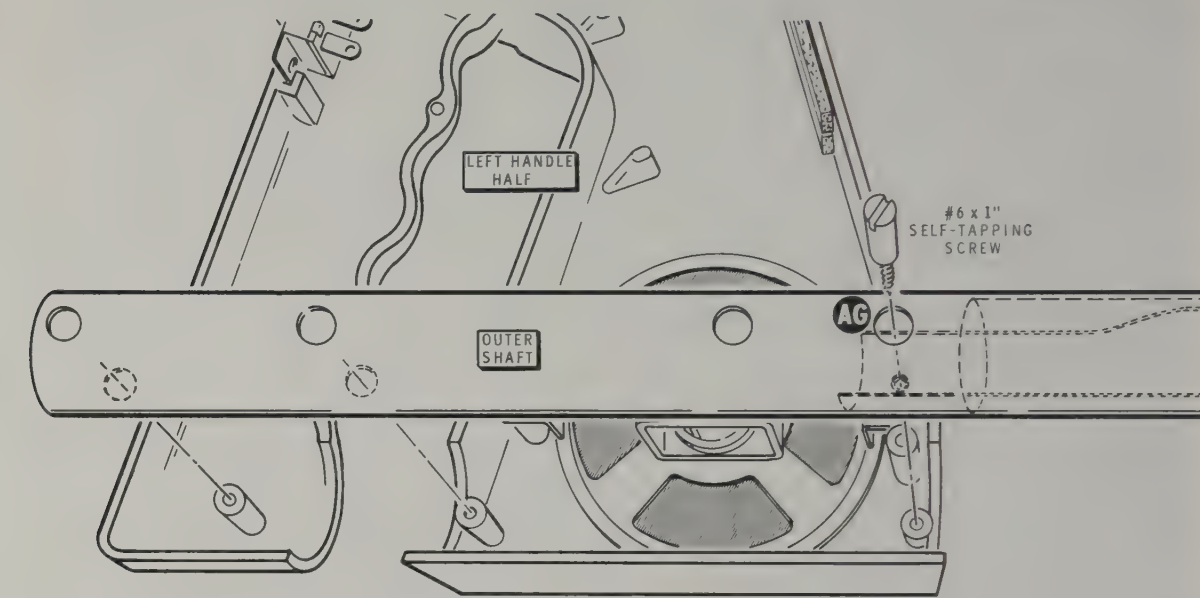




PICTORIAL 3-4



Detail 3-3A



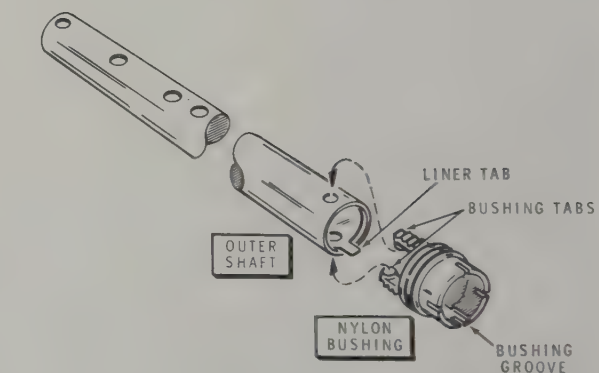
PICTORIAL 3-3

### SHAFT PREPARATION AND INSTALLATION

Refer to Pictorial 3-3 for the following steps.

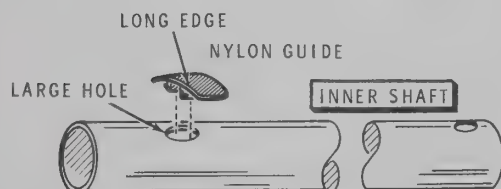
Refer to Detail 3-3A for the following steps.

- ( ) Position the outer shaft as shown so the four holes are on the top side. Then position the shaft liner so its hole is in line with the indicated hole at the end of the outer shaft.
- (✓) Slide the shaft liner into the outer shaft. Line up the liner hole with the outer shaft hole, as indicated.
- (✓) Insert a pencil point through the outer shaft hole and through the liner hole. This will keep the liner hole in position for the next step.
- (✓) Gradually twist the opposite end of the shaft liner until its tab lines up with the indicated hole in the outer shaft. Remove the pencil from the outer shaft.

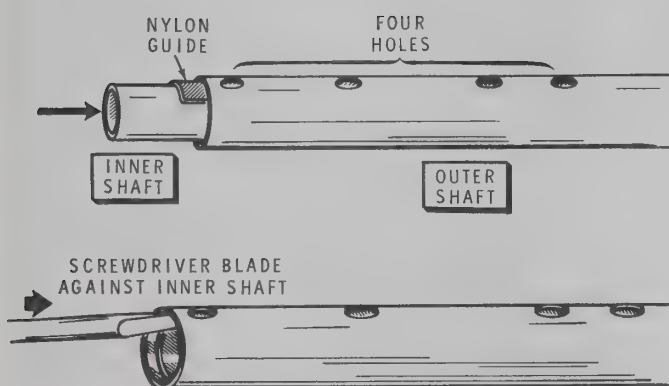


Detail 3-3B

- (✓) Install the nylon bushing on the end of the outer shaft as shown in Detail 3-3B. As the bushing is installed, make sure the liner tab seats in the bushing groove and the bushing tabs seat in the indicated outer shaft holes.



Detail 3-3C



Detail 3-3D

- (✓) Refer to Detail 3-3C and install the nylon guide in the large hole at the large-hole end of the inner shaft. First snap one of its locking tabs in the hole, and then the other locking tab. NOTE: The long edge of the guide should be parallel with the end of the inner shaft.

- (✓) Refer to Detail 3-3D and insert the end of the inner shaft opposite the nylon guide into the four-hole end of the outer shaft. Line the nylon guide up with the four holes while you push the two shafts together.

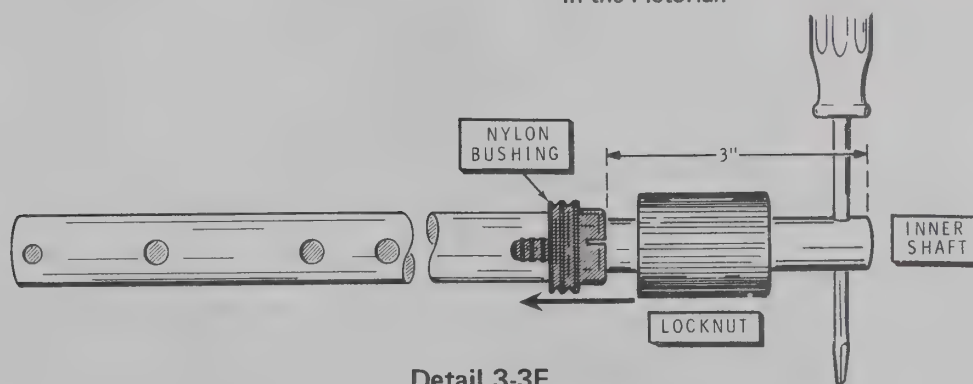
- (✓) Then use a 4", or longer, screwdriver blade to push the inner shaft into the outer shaft, as shown. The other end of the inner shaft should then protrude from the nylon bushing. Be sure to place the screwdriver blade against the inner shaft exactly in the position shown so the shaft liner does not move or get pushed out of the shaft.

- (✓) Insert the screwdriver blade through the small holes in the end of the inner shaft as shown in Detail 3-3E. Then hold the nylon bushing while gradually pulling the inner shaft out to a length of 3" from the nylon bushing. Remove the screwdriver from the inner shaft.

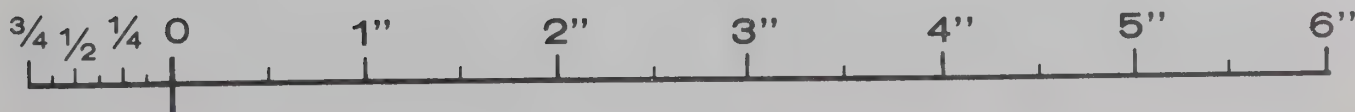
- (✓) Place the locknut on the inner shaft with the threaded portion toward the nylon bushing. Tighten the locknut finger tight on the nylon bushing.

- (✓) Be sure the hole in the shaft liner is in line with the hole in the outer shaft. You may have to use a pencil point to realign the holes.

- (✓) Place the four-hole end of the outer shaft in the left handle half. The four holes should be facing up. Then mount the outer shaft with a #6 x 1" self-tapping screw at AG. Be sure to use the correct screw as shown in the Pictorial.



Detail 3-3E





Refer to Pictorial 3-4 (fold-out from Page 14) for the following steps.

- (✓) Prepare both ends of the 4-wire spiral cable as shown in Part A of Detail 3-4A.
- (✓) Refer to Part B of Detail 3-4A and straighten out the large bare wire.
- (✓) Prepare both ends of the blue stranded wire.
- (✓) Wrap the blue stranded wire around the large bare wire as shown. Leave approximately 6" unwrapped at each end. Then place two small lengths of tape over the wrapped wire at the locations shown. This will temporarily hold the wrapped wire in place.
- (✓) Carefully insert the large bare wire with the wrapped blue stranded wire into the spiral cable as shown.

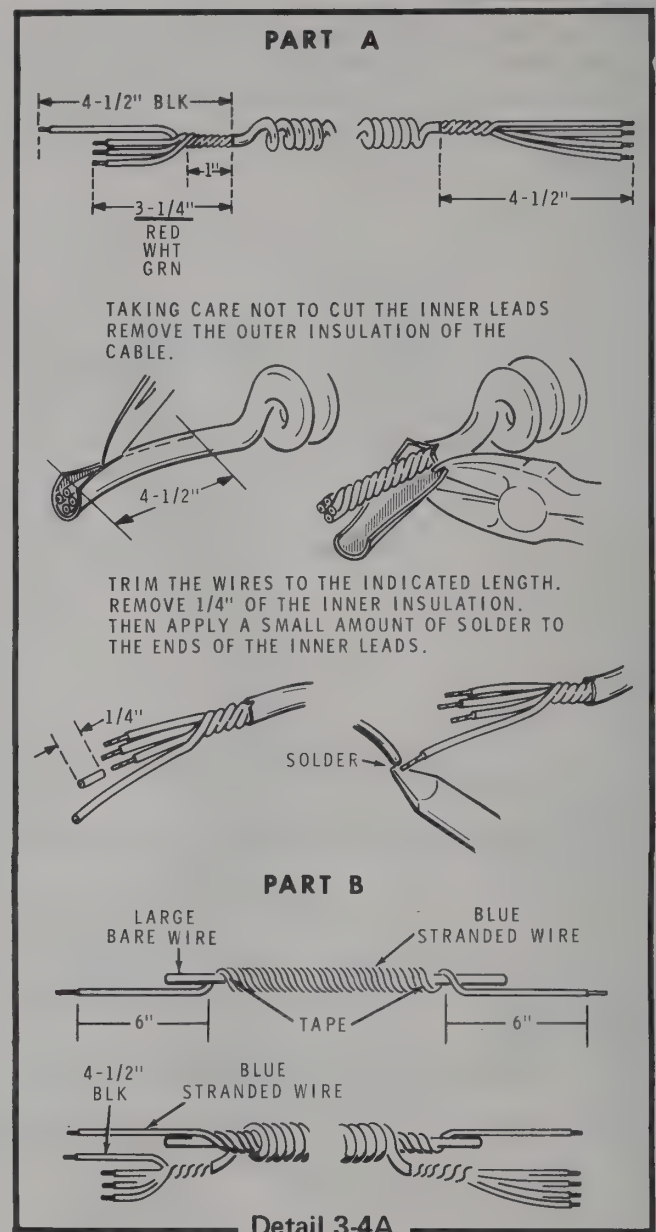
Refer to Detail 3-4B for the following steps.

- (✓) Insert the end of the white hookup wire through hole AH in the outer shaft. Gradually feed the wire into the hole until approximately 6" extends from the shaft as shown.
- (✓) Prepare both ends of the white hookup wire.
- (✓) Bend the remaining amount of white hookup wire toward the 6" end.
- (✓) At one end of the 4-wire spiral cable, twist together the following bare wire ends: black wire, blue stranded wire, and one free end of the white hookup wire. Then apply a small amount of solder to the twisted connection.
- (✓) Twist together the following bare wire ends at the other end of the 4-wire spiral cable: black wire, blue stranded wire, and the free end of the white hookup wire. Then apply a small amount of solder to the twisted connection.

- (✓) Position the white hookup wire and spiral cable exactly as shown in Detail 3-4B.

- (✓) Remove the tape and the large bare wire from the blue stranded wire.

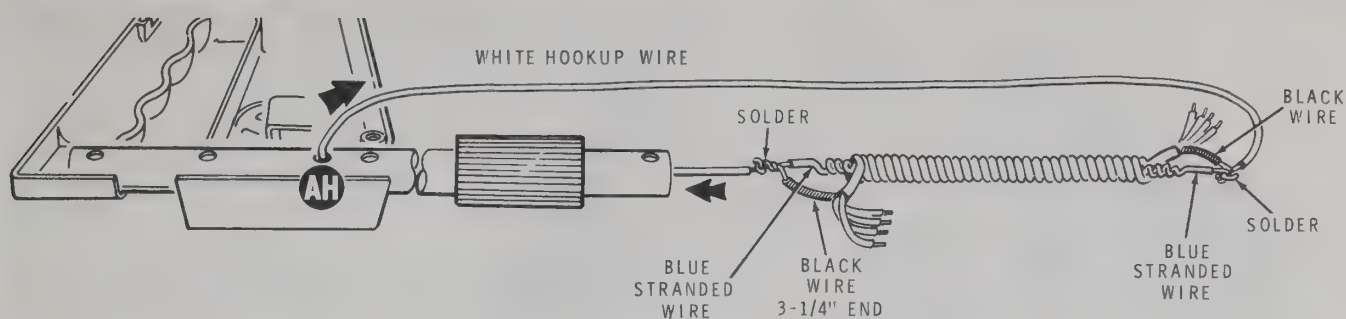
- (✓) Gently pull on the white hookup wire extending from hole AH until the blue stranded wire and the four wires in the 4-wire spiral cable extend from the hole. NOTE: Approximately only 1" of spiral cable insulation should extend from the hole. The rest of the cable and blue stranded wire will be inside the shafts.



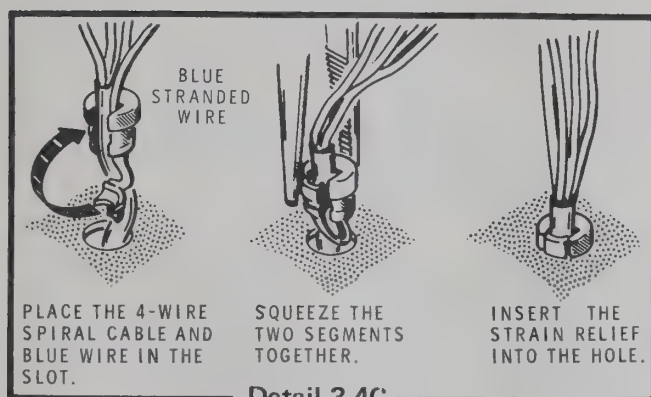
Refer to Pictorial 3-4 for the following steps.

- (✓) Install the strain relief in hole AH as shown in Detail 3-4C. Be sure the blue stranded wire is in the strain relief with the 4-wire spiral cable.
- (✓) Unsolder the white hookup wire from the black wire and blue stranded wire (only from the end extending from the strain relief).

**NOTE:** The 4-wire spiral cable and blue stranded wire will be connected to the audio circuit board in the next steps. Insert each wire into the proper hole from the component side of the circuit board. Then turn the circuit board over and solder the wire to the foil. Cut off any excess wire length.



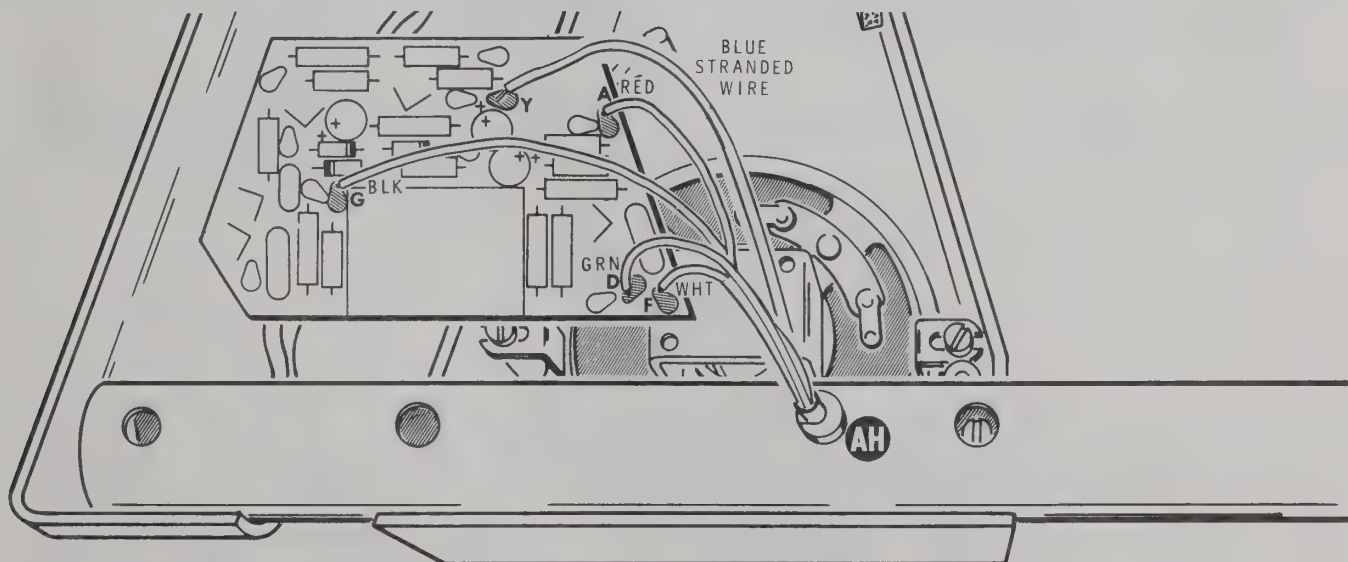
Detail 3-4B



Detail 3-4C

Connect the wires from the 4-wire spiral cable to the audio circuit board as follows. See Detail 3-4D.

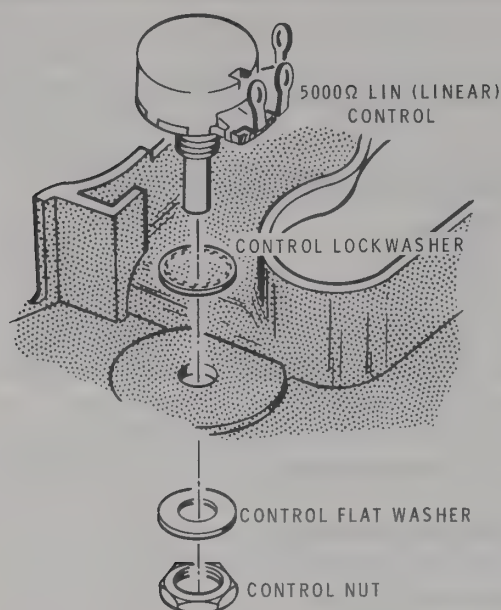
- (✓) White wire to hole F (S-1).
- (✓) Green wire to hole D (S-1).
- (✓) Red wire to hole A (S-1).
- (✓) Black wire to hole G (S-1).
- (✓) Blue stranded wire to hole Y (S-1).
- (✓) Carefully fold over the audio circuit board and place it component-side-down on the speaker. Be sure no wires are pinched between the circuit board and the speaker. Then mount the circuit board to the speaker with 6-32 x 3/16" screws.



Detail 3-4D







Detail 3-5A

Refer to Pictorial 3-5 (fold-out from Page 19) for the following steps.

- (✓) Position the right handle half as shown in Detail 3-5A and mount the 5000  $\Omega$  LIN (linear) control at AJ with a control lockwasher, control flat washer, and control nut. Be sure the lugs are positioned as shown.
- (✓) Peel off the protective backing paper from the remaining length of foam tape. Then press the foam tape into position in the right handle half as shown in Detail 3-5B.
- (✓) Refer to Detail 3-5B and position the right handle half near the left handle half.

(✓) Again refer to the Detail and connect the free end of the green wire through lug 3 (S-2) to lug 2 (S-1) of control AJ in the right handle half.

(✓) Connect the free end of the black wire to lug 1 (S-1) of control AJ in the right handle half.

NOTE: Use only the recommended battery types, as described in the note on Page 4, Deluxe Metal Locator.

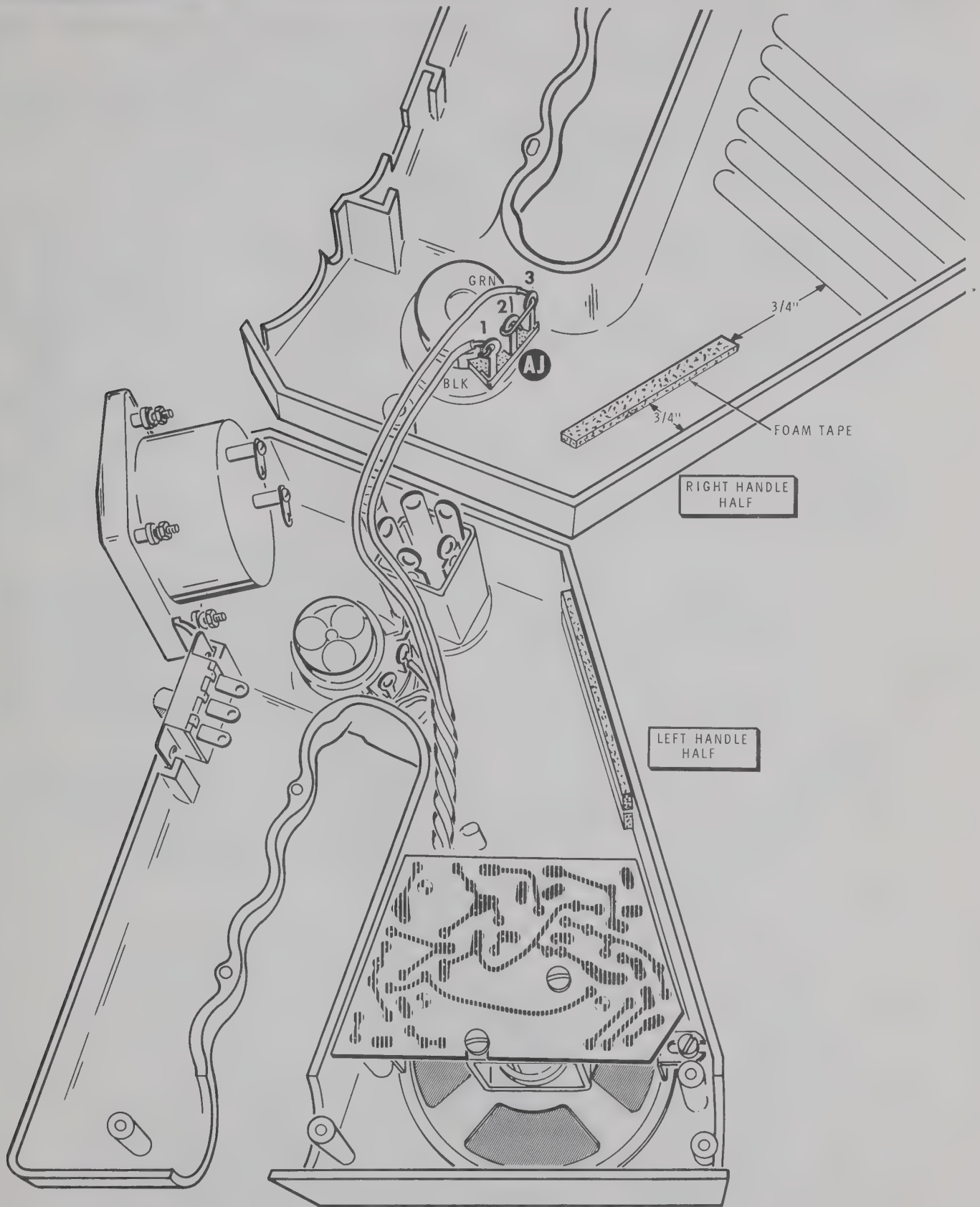
(✓) Attach the battery to the battery connector as shown in Detail 3-5C. Then install the battery in the left handle half between the foam tape and the battery tabs. Be sure the battery connector is in a vertical position on the battery when it is installed.

(✓) Check to be sure there are no unsoldered connections, solder splashes, bare wire ends, or bare wires touching each other in the handle halves.

(✓) Carefully peel away the backing paper from the blue and white identification label. Then press the label into position on the shaft as shown. Be sure to refer to the numbers on the label in any communications you have with the Heath Company about this kit.

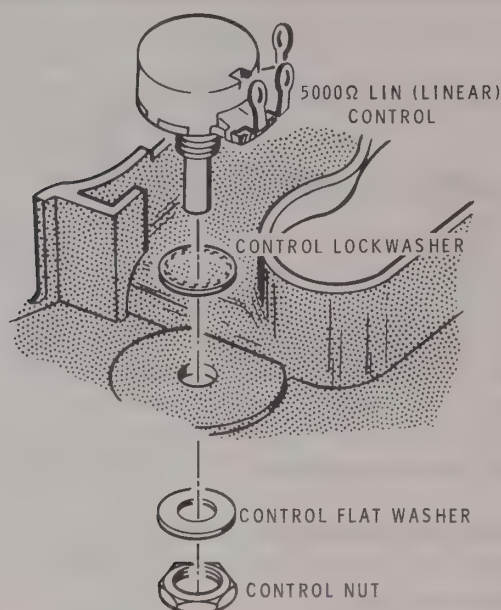
(✓) Carefully fold-over the right handle half onto the left handle half as shown. Be sure no wires are pinched between the handle halves. Then mount the handle halves together with 6-20 x 7/8" self-tapping screws at AP, AK, AL, and AN.

(✓) Install a knob on each control shaft by first lining up the flat on the control shaft with the flattened portion of the knob. Then press the knob onto the shaft.



Detail 3-5B





Detail 3-5A

Refer to Pictorial 3-5 (fold-out from Page 19) for the following steps.

- (✓) Position the right handle half as shown in Detail 3-5A and mount the 5000  $\Omega$  LIN (linear) control at AJ with a control lockwasher, control flat washer, and control nut. Be sure the lugs are positioned as shown.
- (✓) Peel off the protective backing paper from the remaining length of foam tape. Then press the foam tape into position in the right handle half as shown in Detail 3-5B.
- (✓) Refer to Detail 3-5B and position the right handle half near the left handle half.

- (✓) Again refer to the Detail and connect the free end of the green wire through lug 3 (S-2) to lug 2 (S-1) of control AJ in the right handle half.

- (✓) Connect the free end of the black wire to lug 1 (S-1) of control AJ in the right handle half.

NOTE: Use only the recommended battery types, as described in the note on Page 4, Deluxe Metal Locator.

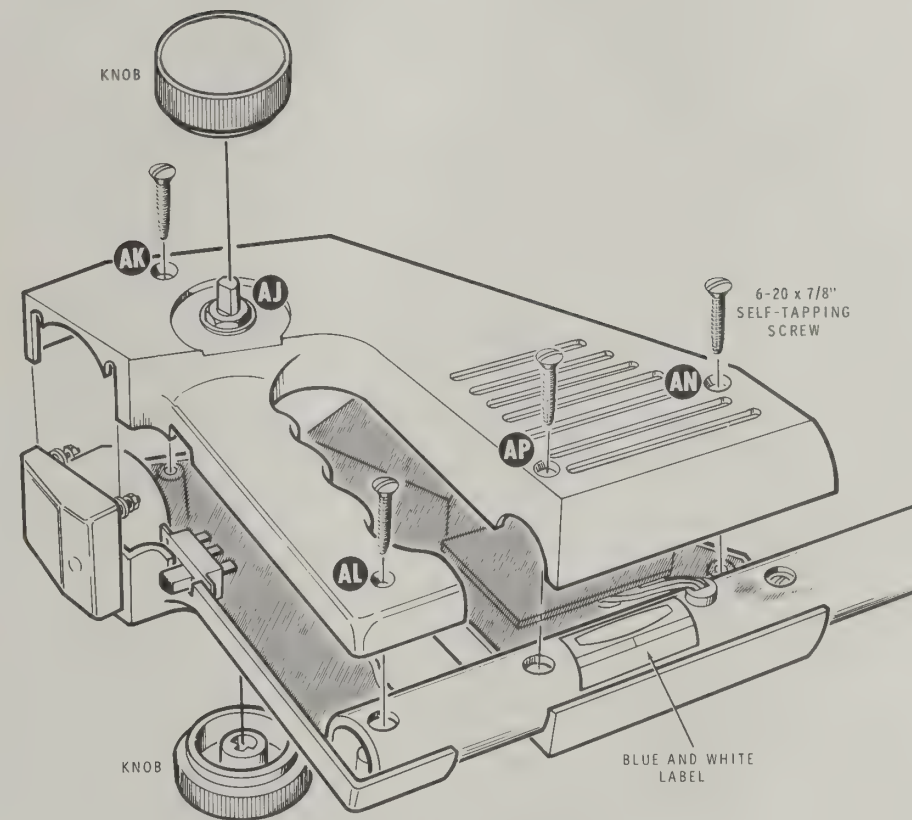
- (✓) Attach the battery to the battery connector as shown in Detail 3-5C. Then install the battery in the left handle half between the foam tape and the battery tabs. Be sure the battery connector is in a vertical position on the battery when it is installed.

- (✓) Check to be sure there are no unsoldered connections, solder splashes, bare wire ends, or bare wires touching each other in the handle halves.

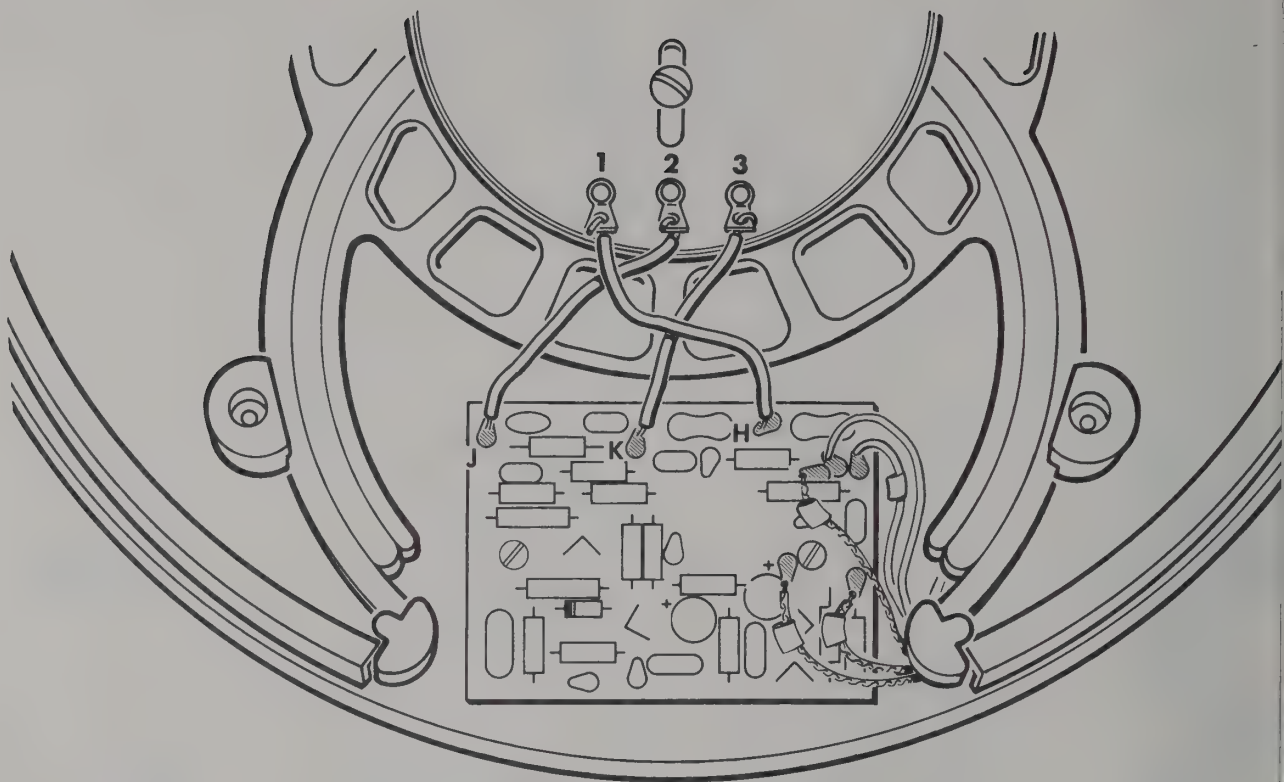
- (✓) Carefully peel away the backing paper from the blue and white identification label. Then press the label into position on the shaft as shown. Be sure to refer to the numbers on the label in any communications you have with the Heath Company about this kit.

- (✓) Carefully fold-over the right handle half onto the left handle half as shown. Be sure no wires are pinched between the handle halves. Then mount the handle halves together with 6-20 x 7/8" self-tapping screws at AP, AK, AL, and AN.

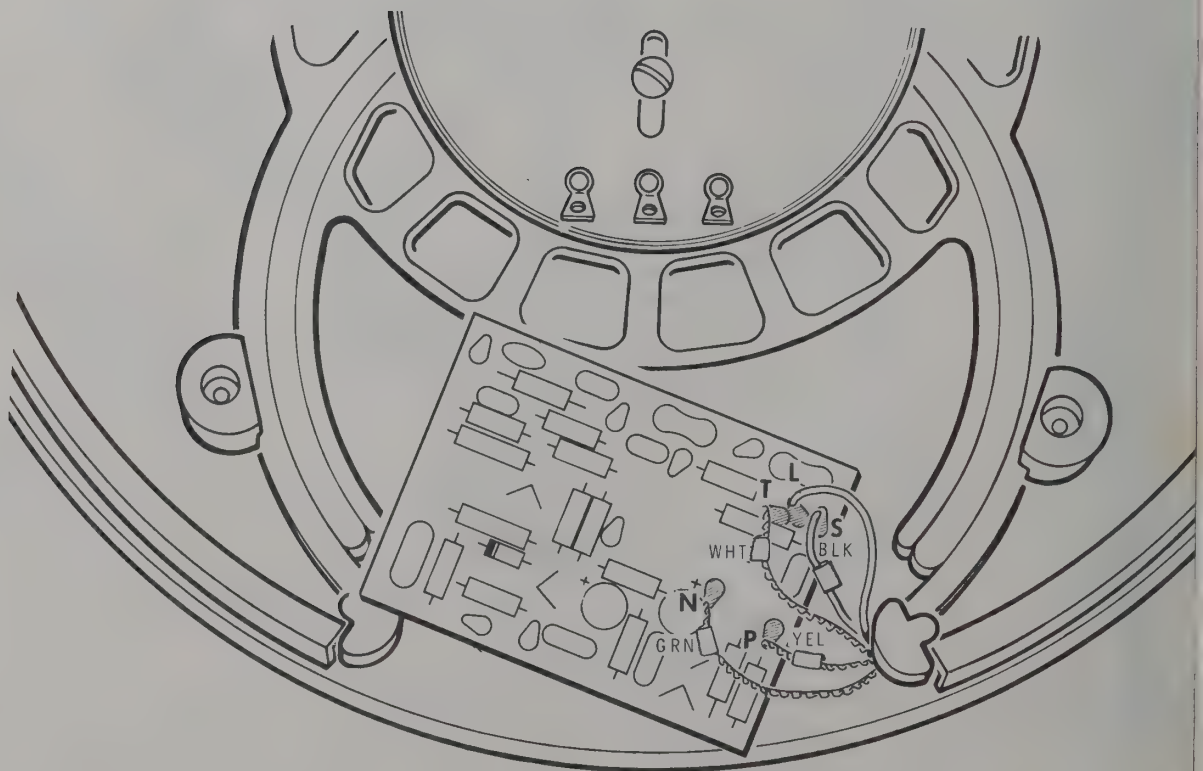
- (✓) Install a knob on each control shaft by first lining up the flat on the control shaft with the flattened portion of the knob. Then press the knob onto the shaft.



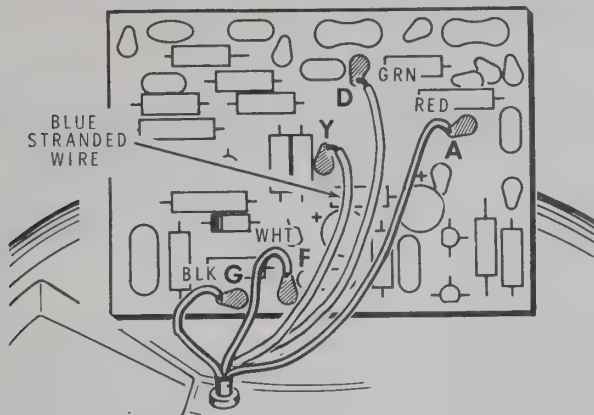




**PICTORIAL 3-7**



**Detail 3-7B**



Detail 3-7A

Refer to Pictorial 3-7 (fold-out from Page 20) for the following steps.

- ( ) . Position the previously assembled search coil circuit board on the bottom side of the coil housing as shown in Detail 3-7A.

**NOTE:** The 4-wire spiral cable will be connected to the search coil circuit board in the next steps. Insert each wire into the proper hole from the component side of the circuit board. Then turn the circuit board over and solder the wire to the foil. Cut off any excess wire length.

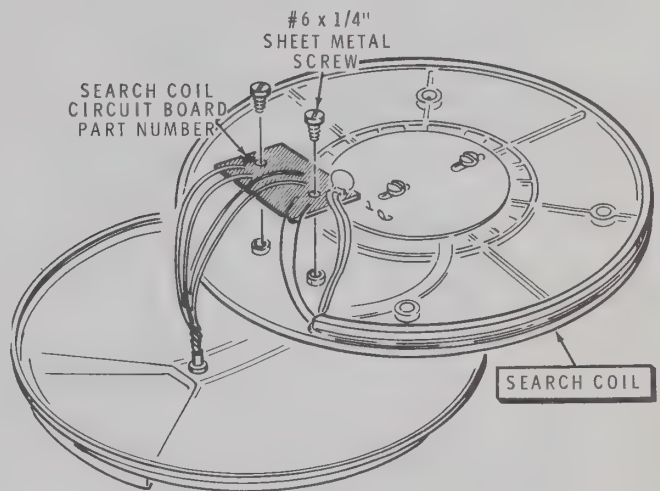
Connect the wires from the 4-wire spiral cable and the blue stranded wire to the search coil circuit board as follows:

- (✓) Black wire to hole G (S-1).
- (✓) White wire to hole F (S-1).
- (✓) Red wire to hole A (S-1).
- (✓) Green wire to hole D (S-1).
- (✓) Blue stranded wire to hole Y (S-1).

In the following steps, you will connect the five color-marked wires from the search coil to the search coil circuit board. Three of these are actually tightly twisted pairs of wires, but they are treated as single wires in these instructions. Refer to Detail 3-7B for the following steps.

**NOTE:** Be sure the tinned portion of the wires extend all the way through the circuit board.

- (✓) Yellow marked wire to hole P (S-1).
- (✓) Green marked wire to hole N (S-1).
- (✓) Black marked wire to hole S (S-1).
- (✓) White marked wire to hole T (S-1).
- (✓) Wire not color marked to hole L (S-1).
- ( ) Cut off the excess wire lengths from the foil side of the circuit board.



Detail 3-7C

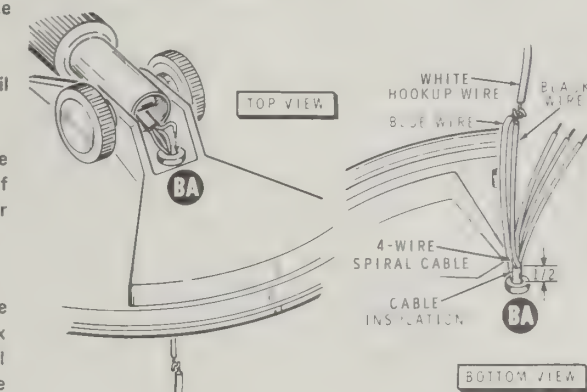
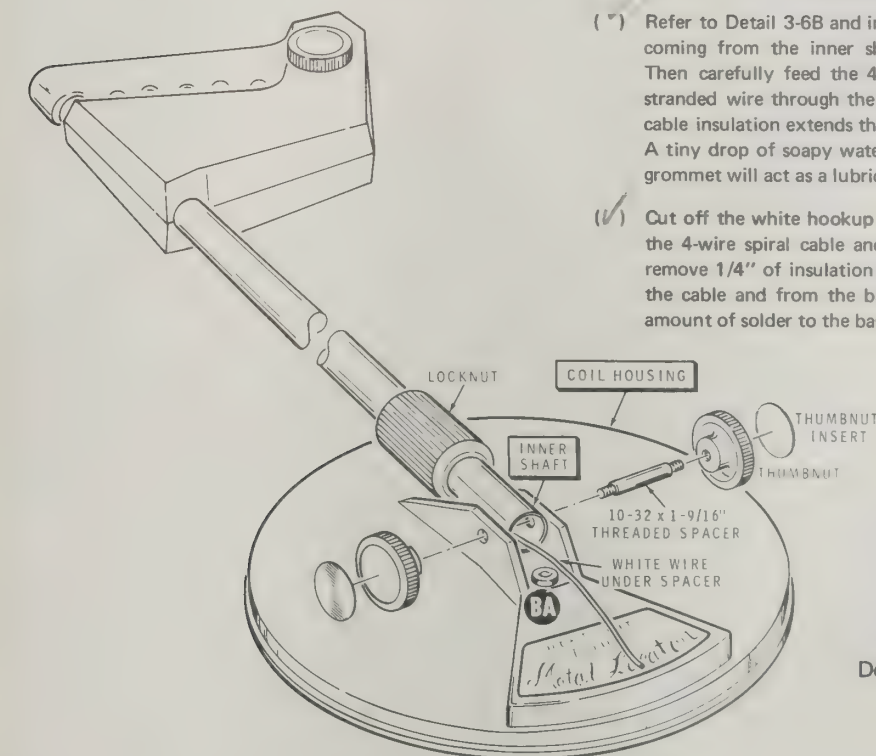
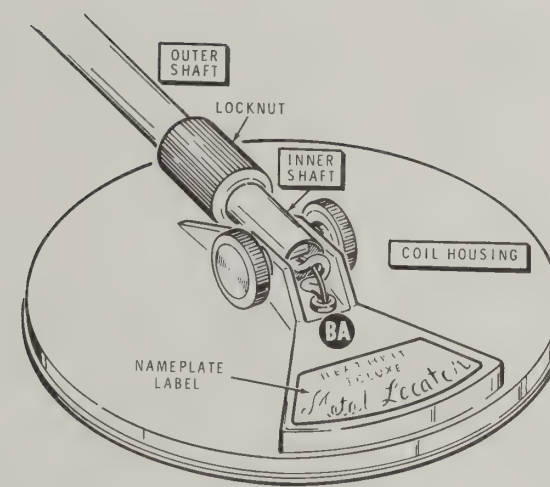
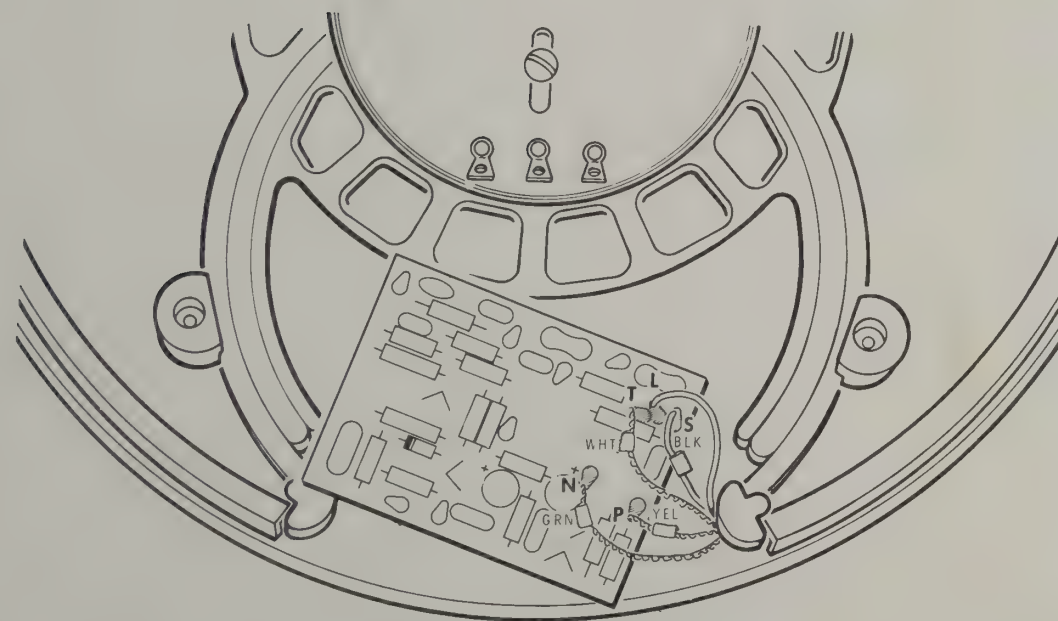
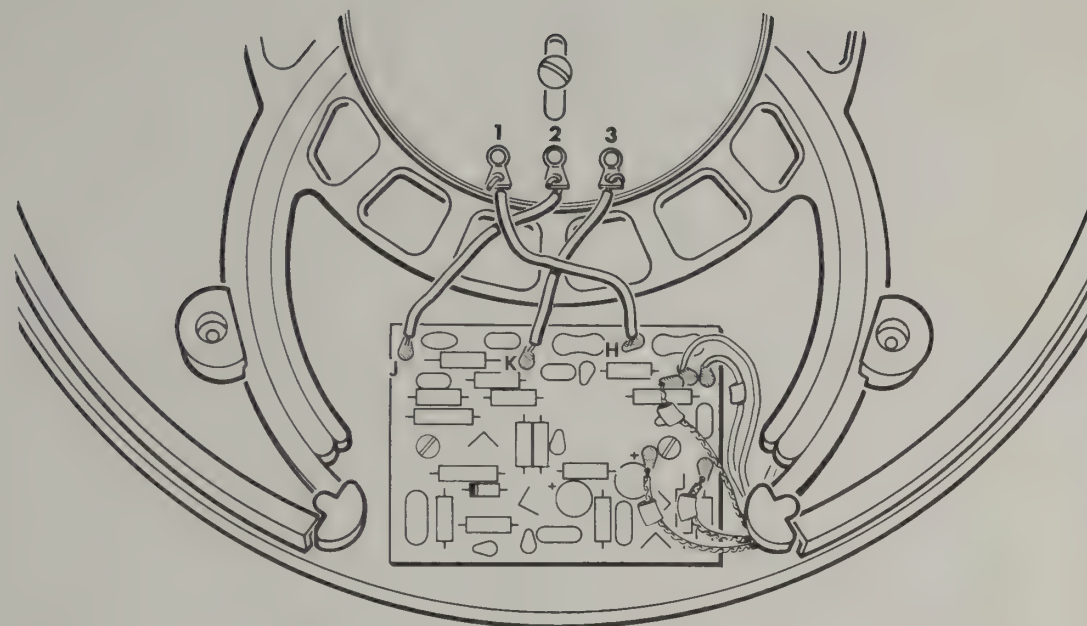
- (✓) Refer to Detail 3-7C and mount the search coil circuit board to the search coil with two #6 x 1/4 inch sheet metal screws.

Refer to Pictorial 3-7 for the following steps.

Connect the free ends of the three white wires coming from the search coil circuit board to the search coil lugs as follows:

- (✓) Wire from hole J to lug 2 (S-1).
- (✓) Wire from hole K to lug 3 (S-1).
- (✓) Wire from hole H to lug 1 (S-1).





## COIL WIRING AND ASSEMBLY

Refer to Pictorial 3-6 (fold-out from this page) for the following steps.

- (✓) Position the handle and shafts as shown in Detail 3-6A. Then loosen the locknut and rotate the inner shaft fully clockwise until it stops. Retighten the locknut.
- (✓) Install a rubber grommet in hole BA in the coil housing as shown in Detail 3-6A.
- (✓) Carefully remove the backing from the nameplate label. Stick the nameplate label on the large section of the coil housing as shown. Smooth the label with your fingers to eliminate any air bubbles.
- (✓) Again refer to Detail 3-6A and place the end of the inner shaft in the coil housing. Insert the 10-32 x 1-9/16" threaded spacer through the holes in the coil housing and the inner shaft. NOTE: Be sure the white wire is below the threaded spacer as shown.

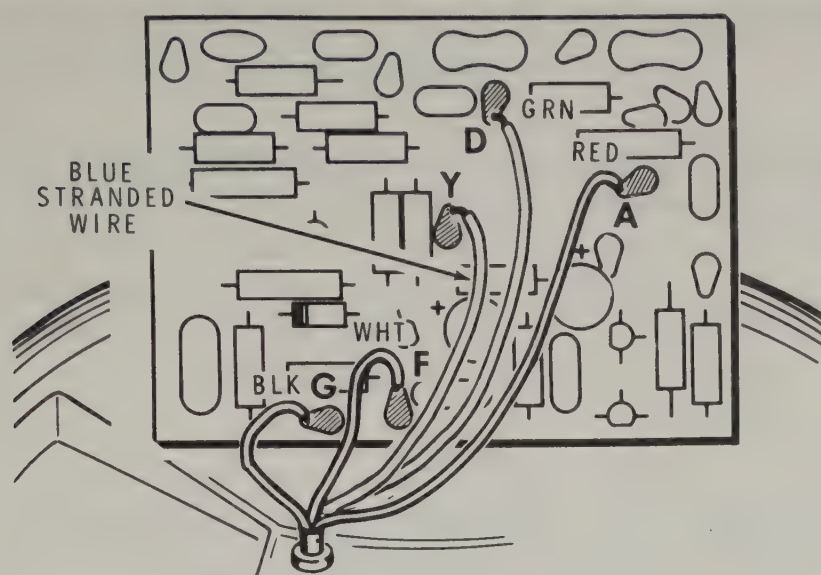
- (✓) Screw a thumbnut onto each end of the threaded spacer and tighten them finger tight.
- (✓) Install a thumbnut insert on each thumbnut. Peel off the protective backing paper and stick the thumbnut insert into position.

**Detail 3-6B**

( 7 ) Refer to Detail 3-6B and insert the white hookup wire coming from the inner shaft through grommet BA. Then carefully feed the 4-wire spiral cable and blue stranded wire through the grommet until 1/2" of the cable insulation extends through the grommet. **NOTE:** A tiny drop of soapy water or liquid detergent on the grommet will act as a lubricant for the cable.

(✓) Cut off the white hookup wire from the black wire in the 4-wire spiral cable and from the blue wire. Then remove 1/4" of insulation from both the black wire in the cable and from the blue wire, and apply a small amount of solder to the bare wire ends.





Detail 3-7A

Refer to Pictorial 3-7 (fold-out from Page 20) for the following steps.

- ( ) Position the previously assembled search coil circuit board on the bottom side of the coil housing as shown in Detail 3-7A.

**NOTE:** The 4-wire spiral cable will be connected to the search coil circuit board in the next steps. Insert each wire into the proper hole from the component side of the circuit board. Then turn the circuit board over and solder the wire to the foil. Cut off any excess wire length.

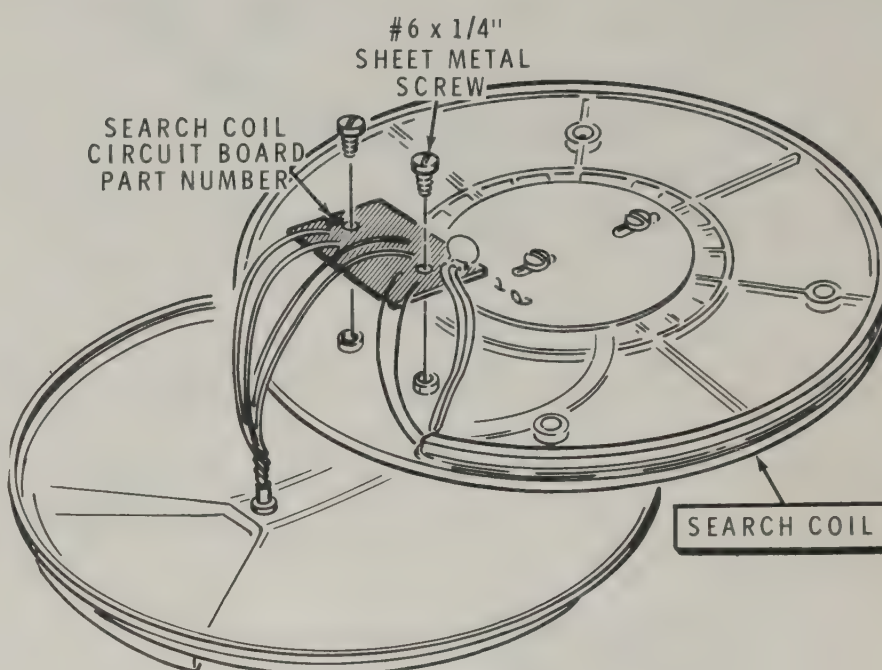
Connect the wires from the 4-wire spiral cable and the blue stranded wire to the search coil circuit board as follows:

- (✓) Black wire to hole G (S-1).
- (✓) White wire to hole F (S-1).
- (✓) Red wire to hole A (S-1).
- (✓) Green wire to hole D (S-1).
- (✓) Blue stranded wire to hole Y (S-1).

In the following steps, you will connect the five color-marked wires from the search coil to the search coil circuit board. Three of these are actually tightly twisted pairs of wires, but they are treated as single wires in these instructions. Refer to Detail 3-7B for the following steps.

**NOTE:** Be sure the tinned portion of the wires extend all the way through the circuit board.

- (✓) Yellow marked wire to hole P (S-1).
- (✓) Green marked wire to hole N (S-1).
- (✓) Black marked wire to hole S (S-1).
- (✓) White marked wire to hole T (S-1).
- (✓) Wire not color marked to hole L (S-1).
- ( ) Cut off the excess wire lengths from the foil side of the circuit board.



Detail 3-7C

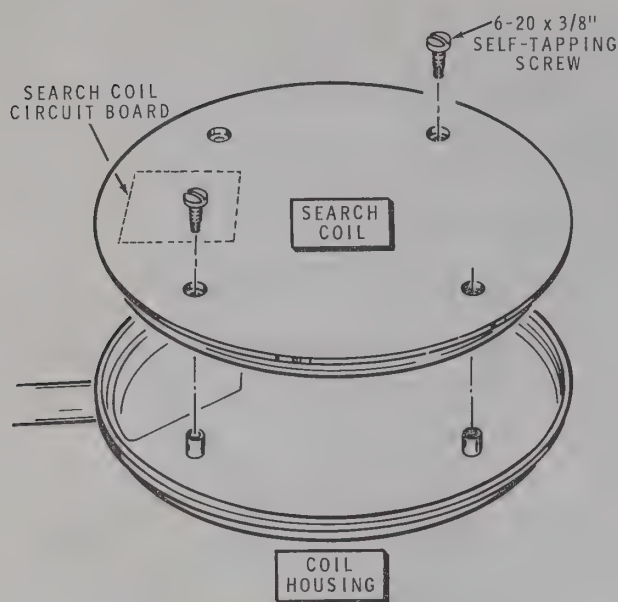
- (✓) Refer to Detail 3-7C and mount the search coil circuit board to the search coil with two #6 x 1/4 inch sheet metal screws.

Refer to Pictorial 3-7 for the following steps.

Connect the free ends of the three white wires coming from the search coil circuit board to the search coil lugs as follows:

- (✓) Wire from hole J to lug 2 (S-1).
- (✓) Wire from hole K to lug 3 (S-1).
- (✓) Wire from hole H to lug 1 (S-1).





PICTORIAL 3-8

Refer to Pictorial 3-8 for the following steps.

- (✓) Carefully fold over the search coil and position it as shown on the coil housing.
- (✓) Temporarily mount the search coil to the coil housing with two 6-20 x 3/8" self-tapping screws.

This completes the assembly of your Deluxe Metal Locator. The remaining hardware and parts will be used during the "Final Assembly" section of the Manual. After the "Initial Tests" are completed, the search coil will be removed from the coil housing, waterproofed, and reassembled. Proceed to "Initial Tests."

## INITIAL TESTS

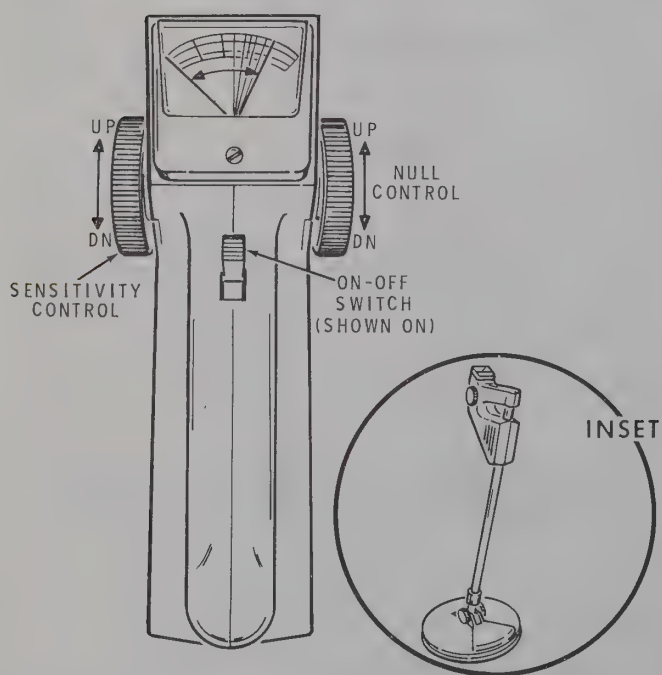


Figure 1

Because there are no internal adjustments, you will check your Deluxe Metal Locator for proper operation in the following manner. First you will adjust it just as you would to put it in operation. Then you will perform an operational check.

Refer to the "In Case of Difficulty" section if you do not obtain the desired results. Be sure the search coil is not near any metal.


**NOTE:** Because you can achieve better accuracy by watching the meter than by listening to the tone, only the meter will be mentioned in the following adjustments.

### SENSITIVITY AND NULL ADJUSTMENTS

Refer to Figure 1 for the following steps.

- ( ) Position the Deluxe Metal Locator so the search coil is positioned as shown in the inset drawing, and away from any metal or metallic objects.
- ( ) Rotate the NULL control to the center of its rotation.

- ( ) Slide the ON-OFF switch to the ON position. You may or may not hear a tone from the speaker.

NOTE: The left handle half is lettered with MAX , which indicates the control direction for maximum sensitivity. UP and DOWN will be used as a convenient reference in some of the following steps instead of the MAX indication.

- ( ) If you do not hear a tone, rotate the SENSITIVITY control down until a meter indication of 6 (six) is obtained. If you hear a tone, rotate the SENSITIVITY control either up or down until you obtain a meter indication of 6.
- ( ) Slowly rotate the NULL control in either direction until you obtain a minimum meter indication (null). NOTE: It is normal if the meter needle drops and remains at zero during some of the control rotation.
- ( ) Alternately rotate the SENSITIVITY control down for a meter indication of 6, and then rotate the NULL control for a minimum meter indication. When rotating the NULL control only increases the meter indication, the best null has been reached.

- ( ) Rotate the SENSITIVITY control so the pointer indicates halfway between 0 and 2 on the meter.

- ( ) Slide the ON-OFF switch to OFF.

## OPERATIONAL CHECK

Refer to Figure 2 for the following steps.

- ( ) Place a dime on a nonmetallic surface where the search coil can be passed over it.
- ( ) Slide the ON-OFF switch to ON.
- ( ) Hold the search coil approximately 2" above the nonmetallic surface and gradually pass it over the dime. Refer to Figure 2 for meter indications and corresponding dime positions.
- ( ) Slide the ON-OFF switch to OFF.

This completes the "Initial Tests." Proceed to "Final Assembly."

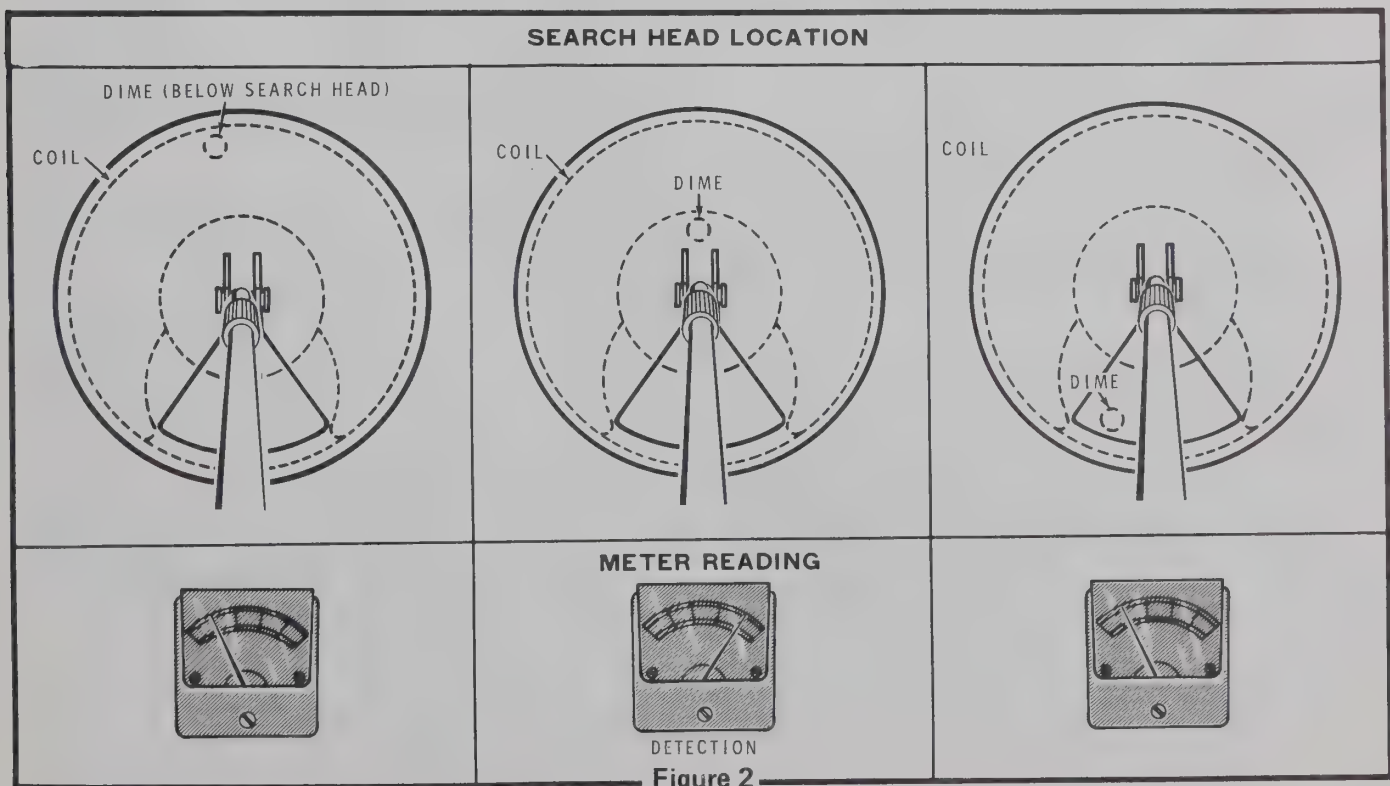
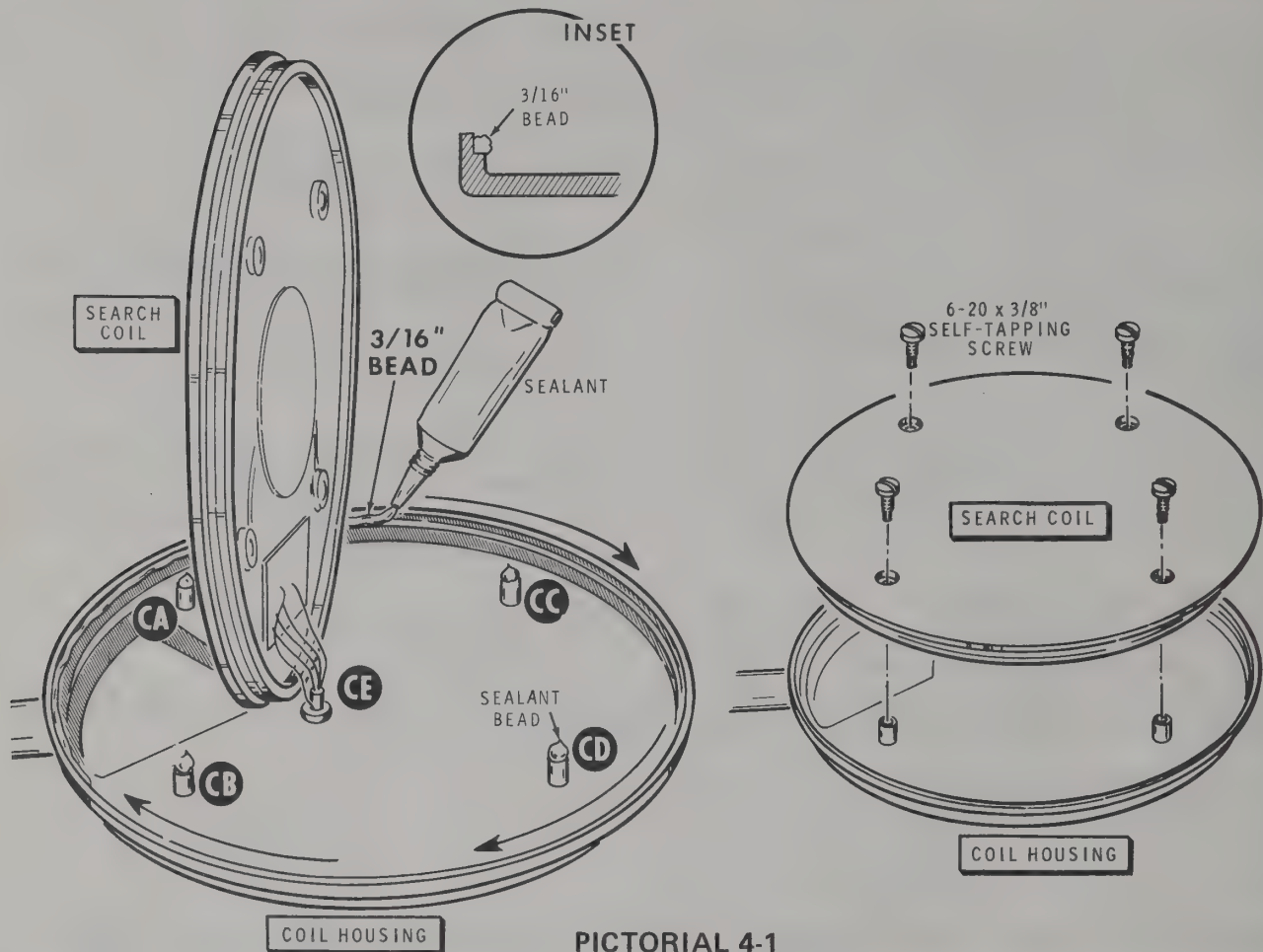


Figure 2



## FINAL ASSEMBLY



PICTORIAL 4-1

Refer to Pictorial 4-1 for the following steps.

- ( ) Remove the two screws. Then remove the search coil from the coil housing. **CAUTION:** Because of the short spiral cable wires, the search coil should be removed carefully so as not to pull these wires loose from the circuit board.
- ( ) Remove the cap from the tube of sealant.
- ( ) Hold the search coil as shown and refer to the inset drawing and run an approximate 3/16" bead of sealant around the inside corner of the coil housing. **CAUTION:** It is important that no air bubbles, or gaps get in the bead.
- ( ) Place an approximate 3/16" drop of sealant on each of the mounting posts in the coil housing at CA, CB, CC, and CD.
- ( ) Place a bead of sealant around the 4-wire spiral cable and blue stranded wire at CE.
- ( ) Carefully fit the search coil into the coil housing and be sure it seats onto the four mounting posts. Then squeeze the search coil and the coil housing together.
- ( ) Mount the search coil to the coil housing with four 6-20 x 3/8" self-tapping screws.
- ( ) Be sure the gap between the edge of the search coil and the coil housing is completely filled with the sealant. Fill any gaps. After this is completed, the sealant will no longer be used.

NOTE: The sealant will set in approximately 1-1/2 hours, and will completely cure in 24 hours to a rubber-like consistency. For a neater job, use a clean cloth to wipe off the excess sealant. A thin residue or film of sealant can be rubbed off easier after it is completely set up.

- ( ) Set the unit aside for 24 hours to allow the sealant to completely cure.

This completes the assembly of your Deluxe Metal Locator. Proceed to the "Operation" section.

## OPERATION

The Heathkit Deluxe Metal Locator is designed for easy operation, but it may require a small amount of practice before you can get the best results and locate buried metal accurately. Read this Operation section carefully to obtain a greater understanding of your Deluxe Metal Locator.

NOTE: Locating small metal in tall grass, wet ground, and especially in wet gravel or sand, may prove difficult. For best results, the ground should be fairly dry.

The search coil may be rotated 90° and folded flat against the shaft. Forcing the search coil to rotate if the shaft is not fully collapsed will damage the shaft liner. When the shaft is fully collapsed, the Deluxe Metal Locator can be carried in the GDA-348-1 carrying case.

### PREPARATION FOR USE

Refer to Figure 3 for the following steps.

1. Loosen the shaft locknut and extend the telescoping shaft to a comfortable length when the search coil is about 2" above the ground. Retighten the shaft locknut.
2. Position your Deluxe Metal Locator so the search coil is folded down as shown and away from any metal or metallic objects.
3. Rotate the NULL control to the center of its rotation.
4. Slide the ON-OFF switch to the ON position. You may or may not hear a tone from the speaker.
5. If you do not hear a tone, rotate the SENSITIVITY control down until a meter indication of 6 (six) is obtained. If you hear a tone, rotate the SENSITIVITY control either up or down until you obtain a meter indication of 8.
6. Slowly rotate the NULL control in either direction until you obtain a minimum meter indication (null). NOTE: It is normal if the meter needle drops and remains at zero during some of the control rotation.
7. Alternately rotate the SENSITIVITY control down for a meter indication of 6, and then rotate the NULL control for a minimum meter indication. The best null has been reached, when rotating the NULL control either way only increases the meter indication.
8. Rotate the SENSITIVITY control so the pointer indicates halfway between 0 and 2 on the meter.
9. Slide the ON-OFF switch to OFF.

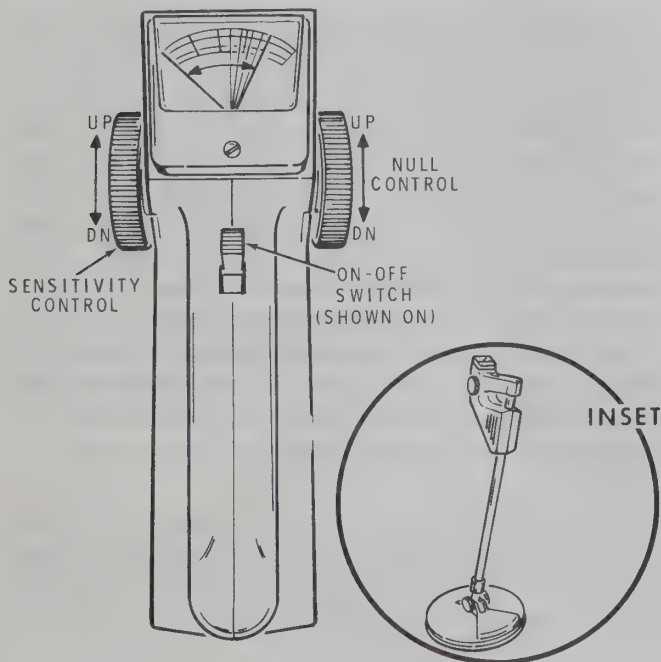


Figure 3



## HOW TO USE THE METAL LOCATOR

1. Place a dime on a nonmetallic surface where the search coil can be passed over it.
2. The most sensitive spot on the search coil is just forward of the shaft thumbnuts. When this spot on the search coil is directly over the buried metal, the strongest indication will be obtained, thus pinpointing the location of the metal.
3. Slide the ON-OFF switch to ON.
4. Readjust the SENSITIVITY and NULL controls while holding the search coil about 2" above the surface to be searched.
5. Hold the search coil approximately 2" above the nonmetallic surface and gradually pass it over the dime. Figure 4 (fold-out from Page 29) illustrates the meter indication as a small coin is detected. The audio tone will also increase. Headphones (such as 2000  $\Omega$  Superex Model GD-396) may be used to provide a more sensitive means of detecting this increase. The speaker is automatically disconnected when headphones are used.
6. Slide the ON-OFF switch to OFF.
7. When you search for small metal objects, such as a coin, or for deeply buried metal, it is best to use the signal meter — which provides a more sensitive indication than the audio signal.
8. Practice finding various sizes and types of metal you have planted. The better you become acquainted with your Deluxe Metal Locator, the easier it will be for you to find buried metal.
9. Remove the battery when the Deluxe Metal Locator is to be stored for a long period of time.

## OPERATING HINTS

The following information is provided to help you to have a more enjoyable and rewarding experience using the Deluxe

Metal Locator. Time spent in experimenting under varying conditions and situations will eventually make you a real "pro."

The sensitivity of a metal locator is to a surface parallel to the search coil rather than an edge. For example, a coin on edge or a pipe on end is harder to find than if they were lying flat. Metal locators are actually finding the closest surface area rather than the bulk or mass of an object.

The search coil is sensitive to increases in the electrical conductivity of an object. An example would be that metal objects have more conductivity than the surrounding earth. As a result, a damp beach (especially a salt water beach) has more conductivity than the dry sand away from the water, or dirt in a field. These high conductivity conditions will somewhat decrease the sensitivity. This may cause you to detect footprints on a beach or dense grass areas that retain dew.

## FERROUS VS NONFERROUS METAL DETECTING

NOTE: The following technique can be quite useful, since most precious metals are nonferrous.

The Heathkit Deluxe Metal Locator can either be operated as described above, with the NULL control adjusted for an exact null; or it can be operated with the NULL control adjusted slightly up or down (see Figure 3) from the exact null position. If you adjust the NULL control slightly down (see Figure 3) from the exact null position, both ferrous and nonferrous metals will produce an increase in the meter indication and tone. However, if you adjust the NULL control slightly up from the exact null position, ferrous and nonferrous metals produce different results. The nonferrous metals will produce an increase in the meter indication and tone. Ferrous metals will cause the meter indication and tone to decrease. Ferrous metal objects which have been plated will act as nonferrous metal.

If a ferrous metal and a similar-sized nonferrous metal were located near each other, a situation could occur where only a slight meter indication would occur because the two forces would tend to balance each other out.

## IN CASE OF DIFFICULTY

This section of the Manual is divided into two parts: "Visual Checks," and the "Troubleshooting Chart." Begin your search by carefully following the checks listed below. After they are completed, refer to the "Troubleshooting Chart" if necessary.

### VISUAL CHECKS

**NOTE:** The following checks will be most effective if you apply them to one circuit board, or other part of the kit, at a time.

The sealant can be removed by pulling it away from the coil housing like a large rubber band. Use a small knife or pick to make a loose end. Then carefully pry the search coil away from the coil housing. Pry only by the raised portion of the coil housing. This will not damage the search coil windings.

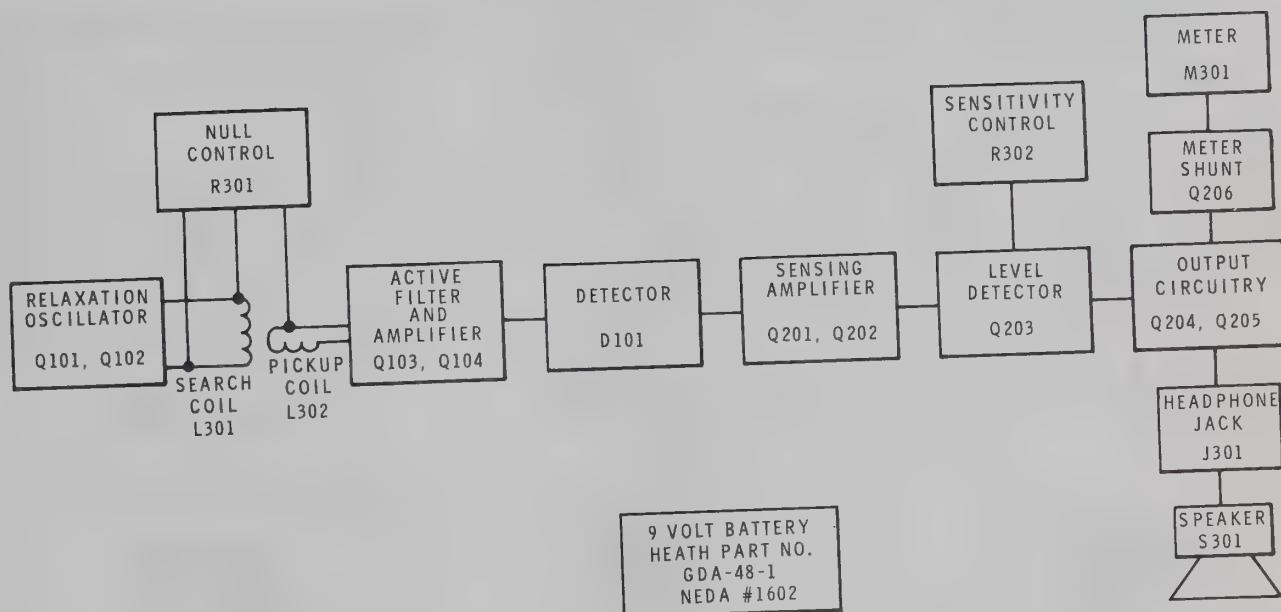
**CAUTION:** Use only the Heath sealant to reseal a search coil. It does not have a caustic base chemical as do most bathtub caulking.

1. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by a careful inspection of connections to make sure they are soldered as described in the "Soldering" section of the "Kit Builders Guide." Resolder any doubtful connections and be sure all the wires are soldered at places where several wires are connected.  
  
2. Check each circuit board to be sure there are no solder bridges between adjacent connections. Remove any solder bridges by holding a clean soldering iron tip between the two points that are bridged until the excess solder flows down the tip of the soldering iron.  
  
3. Be sure each transistor is in the proper location (correct part number and type number). Be sure that each transistor lead is positioned properly and has a good solder connection to the foil.  
  
4. Check capacitor values carefully. Be sure the proper part is wired into the circuit at each capacitor location. Always check the polarity of electrolytic capacitors to be sure they are installed correctly.  
  
5. Check each resistor carefully. It would be easy, for example, to install a 1000  $\Omega$  (brown-black-red) resistor where a 100 k $\Omega$  (brown-black-yellow) resistor is called for. A resistor that is discolored, or cracked, or shows any sign of bulging would indicate that it is faulty and should be replaced.  
  
6. Be sure the correct diode is installed at each diode location, and that the banded end is positioned correctly.  
  
7. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.  
  
8. Check all component leads connected to the circuit boards. Make sure the leads do not extend through the circuit board and make contact with other connections or parts.
- If the trouble is not located after the "Visual Tests" are completed and a voltmeter is available, check voltage readings against those shown in the Schematic Diagram and "X-Ray Views." A review of the "Circuit Description" may also help you determine the cause of a trouble.



## Troubleshooting Chart

DIFFICULTY	POSSIBLE CAUSE
No sound in the speaker and no meter deflection when the unit is turned on and the Sensitivity control is advanced fully clockwise.	<ol style="list-style-type: none"> <li>1. Battery dead.</li> <li>2. Phone jack wired incorrectly.</li> <li>3. Transistors or other components incorrectly installed.</li> <li>4. Search coil incorrectly connected.</li> <li>5. Pickup coil leads shorted.</li> <li>6. Broken lead to battery.</li> <li>7. Search coil leads shorting together.</li> </ol>
Sound is heard from the speaker and meter indicates full scale regardless of Sensitivity setting.	<ol style="list-style-type: none"> <li>1. NULL control R301 not adjusted for null.</li> <li>2. Search coil or pickup coil improperly connected.</li> <li>3. Search coil leads shorting together.</li> </ol>
Unable to obtain a minimum reading during adjustments.	<ol style="list-style-type: none"> <li>1. NULL control R301 incorrectly wired.</li> <li>2. Search coil or pickup coil improperly connected.</li> <li>3. Search coil leads shorting together.</li> </ol>
Meter does not indicate or indicates backwards. Audio circuits operate properly.	<ol style="list-style-type: none"> <li>1. Phone jack wired incorrectly.</li> <li>2. Meter leads reversed.</li> <li>3. Q207.</li> <li>4. Meter 301.</li> <li>5. Search coil leads shorting together.</li> </ol>
Poor sensitivity.	<ol style="list-style-type: none"> <li>1. Weak battery.</li> <li>2. Improper adjustment (refer to the Operation section).</li> <li>3. Transistors Q103, Q104, Q201, Q202, Q203, Q205, and/or Q206.</li> <li>4. Search coil or pickup coil have shorted windings or leads.</li> <li>5. Earth is so conductive that metal objects are not detected.</li> </ol>
Erratic response when searching at a constant height above a small area of ground containing unknown objects.	<ol style="list-style-type: none"> <li>1. NULL control adjusted so ferrous metals produce a decrease in the meter indication and tone, and nonferrous metals produce an increase. Refer to the "Operation" section of the Manual.</li> </ol>



**BLOCK DIAGRAM**



## Troubleshooting Chart

DIFFICULTY	POSSIBLE CAUSE
No sound in the speaker and no meter deflection when the unit is turned on and the Sensitivity control is advanced fully clockwise.	<ol style="list-style-type: none"> <li>1. Battery dead.</li> <li>2. Phone jack wired incorrectly.</li> <li>3. Transistors or other components incorrectly installed.</li> <li>4. Search coil incorrectly connected.</li> <li>5. Pickup coil leads shorted.</li> <li>6. Broken lead to battery.</li> <li>7. Search coil leads shorting together.</li> </ol>
Sound is heard from the speaker and meter indicates full scale regardless of Sensitivity setting.	<ol style="list-style-type: none"> <li>1. NULL control R301 not adjusted for null.</li> <li>2. Search coil or pickup coil improperly connected.</li> <li>3. Search coil leads shorting together.</li> </ol>
Unable to obtain a minimum reading during adjustments.	<ol style="list-style-type: none"> <li>1. NULL control R301 incorrectly wired.</li> <li>2. Search coil or pickup coil improperly connected.</li> <li>3. Search coil leads shorting together.</li> </ol>
Meter does not indicate or indicates backwards. Audio circuits operate properly.	<ol style="list-style-type: none"> <li>1. Phone jack wired incorrectly.</li> <li>2. Meter leads reversed.</li> <li>3. Q207.</li> <li>4. Meter 301.</li> <li>5. Search coil leads shorting together.</li> </ol>
Poor sensitivity.	<ol style="list-style-type: none"> <li>1. Weak battery.</li> <li>2. Improper adjustment (refer to the Operation section).</li> <li>3. Transistors Q103, Q104, Q201, Q202, Q203, Q205, and/or Q206.</li> <li>4. Search coil or pickup coil have shorted windings or leads.</li> <li>5. Earth is so conductive that metal objects are not detected.</li> </ol>
Erratic response when searching at a constant height above a small area of ground containing unknown objects.	<ol style="list-style-type: none"> <li>1. NULL control adjusted so ferrous metals produce a decrease in the meter indication and tone, and nonferrous metals produce an increase. Refer to the "Operation" section of the Manual.</li> </ol>

## FACTORY REPAIR SERVICE

You can return your completed kit to the Heath Company Service Department to have it repaired for a minimum service fee. (Kits that have been modified will not be accepted for repair.) If you wish, you can deliver your kit to a nearby Heathkit Electronic Center. These centers are listed in your Heathkit catalog.

To be eligible for replacement parts under the terms of the warranty, equipment returned for factory repair service, or delivered to a Heathkit Electronic Center, must be accompanied by the invoice or the sales slip, or a copy of either. If you send the original invoice or sales slip, it will be returned to you.

If it is not convenient to deliver your kit to a Heathkit Electronic Center, please ship it to the factory at Benton Harbor, Michigan and follow the following shipping instructions:

Prepare a letter in duplicate, containing the following information:

- Your name and return address.
- Date of purchase.

- A brief description of the difficulty.
- The invoice or sales slip, or a copy of either.
- Your authorization to ship the repaired unit back to you C.O.D. for the service and shipping charges, plus the cost of parts not covered by the warranty.

Attach the envelope containing one copy of this letter directly to the unit before packaging, so that we do not overlook this important information. Send the second copy of the letter by separate mail to Heath Company, Attention: Service Department, Benton Harbor, Michigan, 49022.

Remove the battery and then check the equipment to see that all parts and screws are in place. Then, wrap the equipment in heavy paper. Place the equipment in a strong carton, and put at least **THREE INCHES** of resilient packing material (shredded paper, excelsior, etc.) on all sides, between the equipment and the carton. Seal the carton with gummed paper tape, and tie it with a strong cord. Ship it by prepaid express, United Parcel Service, or insured parcel post to:

Heath Company  
Attention: Service Department  
Benton Harbor, Michigan 49022

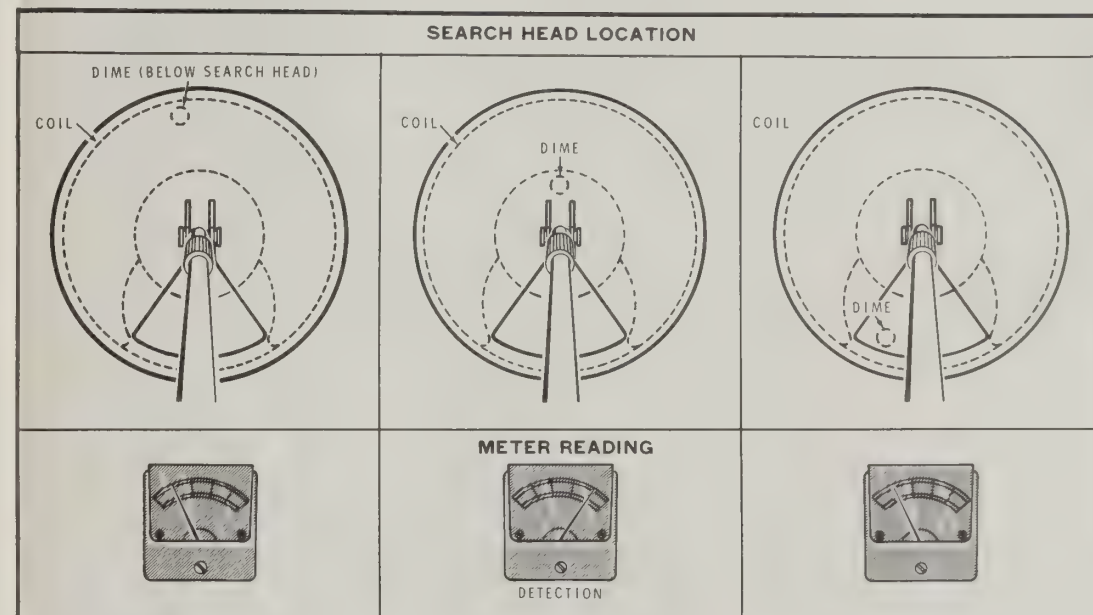


Figure 4



SPECIFICATIONS

ELECTRICAL

Sensitivity . . . . .	Detects dime-sized metal up to 6" in air.
Frequency . . . . .	Search coil oscillator: 100 kHz. Audio modulation: approximately 500 Hz.
Power Source . . . . .	9 volt battery (NEDA #1602, or equivalent). Heath Part GDA-48-1.
Battery Life . . . . .	50 hours (approximate, under normal operating conditions).

GENERAL

Detection Method . . . . .	Induction balance circuit.
Detector Output . . . . .	Built-in meter and speaker. Phone jack provided for accessory headphones.
Search Coil Diameter . . . . .	10".
Overall Dimensions . . . . .	Search coil housing: 10-1/2". Extended height: 36". Collapsed height: 28".
Waterproof . . . . .	Search coil housing submersible to two (2) feet.
Net Weight . . . . .	3-1/2 lbs.

ACCESSORIES

Zippered carrying case . . . . .	Heath Model GDA-348-1.
Cushioned Headphones . . . . .	Heath Model GD-396.

Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligations to incorporate new features in instruments previously sold.

## CIRCUIT DESCRIPTION

Refer to the "Block Diagram" (fold-out from Page 30) and the Schematic Diagram (fold-out from Page 35) while you read this "Circuit Description." The Deluxe Metal Locator circuitry will be described in three sections: the search and pickup coils, and null control; the active filter, amplifier, and detector; and the sensing amplifier and output circuitry.

### SEARCH AND PICKUP COILS WITH NULL CONTROL

Transistors Q101 and Q102 form a relaxation oscillator. The base voltage of Q101 is determined by R102 and R103, and its emitter voltage is determined by the time constant formed by R101 and C101. This time constant also determines the 500 Hz repetition frequency of this oscillator. The oscillator operates from positive feedback provided by R103 and the direct connection between the collector of Q101 and the base of Q102.

When the charge rate of C101 provides an emitter voltage at Q101 that is approximately .5 volts higher than the base voltage, Q101 begins to conduct and discharge C101. C101 continues to discharge until the emitter voltage at Q101 causes this stage to cut off again. This charge and discharge pulse is amplified by Q102 and applied across the P to N winding of search coil L301.

L301 and C104 are connected in a tuned circuit that resonates at 100 kHz. This tuned circuit is excited into oscillation by the 500 Hz pulse signal from Q102. The output that results across the coil is a 100 kHz signal that is modulated with a 500 Hz envelope.

**NOTE:** Search coil L301 and pickup coil L302 have practically no magnetic coupling between them. This is due to the unusual shape of the search coil and the positioning of the pickup coil.

Null control R301 serves as part of a voltage divider between taps P and T of L301. This divider also includes resistors R106 and R104, and blocking capacitor C103. The signal at each end of the divider is equal in amplitude and opposite in phase. Therefore, the Null control adjusts the amplitude and phase of a small amount of modulated signal that is coupled through C106 to the pickup coil. This small signal is used to help cancel any residual signal that is coupled from the search coil to the pickup coil. As the resistance of the Null control is increased, less signal is coupled from tap P through C106. As the Null resistance is decreased, more signal is coupled from tap P.

When the search coil is passed over a metal object, the magnetic field of the search coil induces a current in that object. This induced current causes the object to set up its own magnetic field. This magnetic field around the object induces a current in the pickup coil which provides the signal used for detection.

### ACTIVE FILTER-AMPLIFIER-DETECTOR

An active filter and highly stable amplifier is formed by Q103, Q104, and their associated circuitry, including R107, R109, C109, and C110. The filter, which is used to shape the frequency response of the amplifier, rolls off (attenuates) second and higher-order harmonics above 100 kHz.

Bias conditions for the amplifier are established by R110 and R111, while R113 and R114 determine the gain. The output of the circuit is an audio-modulated 100 kHz carrier signal.

The output signal from the collector of Q104 is demodulated by D101; R115 provides forward bias for detector diode D101. The resulting 500 Hz audio signal is coupled to the audio output portion of the circuitry while R116, C112, and C113 filter out any 100 kHz residue to assure a clean audio signal.

### SENSING AMPLIFIER — OUTPUT CIRCUITRY

The audio signal from the detector is coupled through C201 to a fixed gain amplifier, Q201 and Q202, that is similar to the amplifier circuit of Q103 — Q104. R201 and R202 establish the bias and R203 and R204 determine the gain of the amplifier.

From Q202, the audio signal is coupled through R207 and C203 to a sensing amplifier composed of Q203 and Q204. The Sensitivity control, which is connected to the base of Q203, is set so Q203 is in saturation when only residual noise and residual audio is present at its base. Then, as soon as even a small, 500 Hz audio signal is present (indicating the presence of metal), Q203 begins to amplify the signal. D201 and D202 serve as temperature-compensating devices for Q203 by increasing or decreasing the current in its base bias circuit when temperature changes occur.



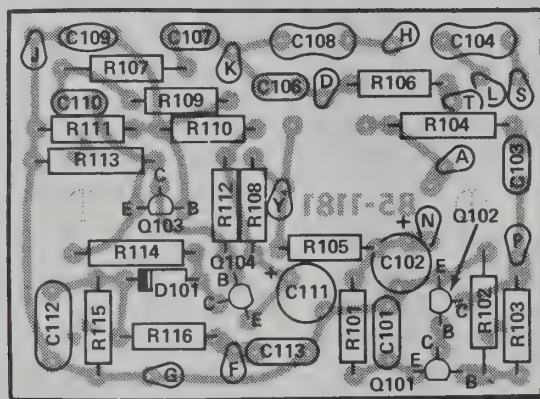
The audio signal is further amplified by transistors Q204 and Q205 to a level sufficient to drive the speaker or optional headphones. When the headphones are plugged into the headphone jack, a resistor is switched across the amplifier output. This keeps the amplifier operating at a constant load impedance.

Transistor Q206 operates as a meter shunt when a large audio signal is encountered. This allows the meter to operate normally unless very large signals are encountered. Under large signal conditions, Q206 conducts, protecting the meter.

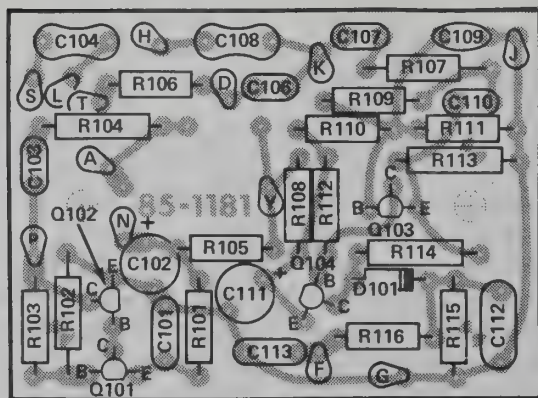
## CIRCUIT BOARD X-RAY VIEWS

NOTE: To determine the value ( $12\text{ k}\Omega$ ,  $.01\text{ }\mu\text{F}$ , etc.) of one of these parts, you may proceed in either of the following ways.

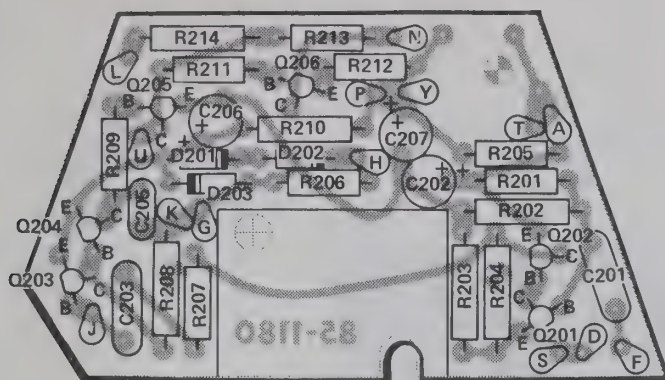
1. Refer to the place where the part is installed in the Step-by-Step instructions.
2. Note the identification number of the part (R-number, C-number, etc.). Then locate the same identification number, next to the part on the Schematic. The value, or "description" of the part will be near this number.



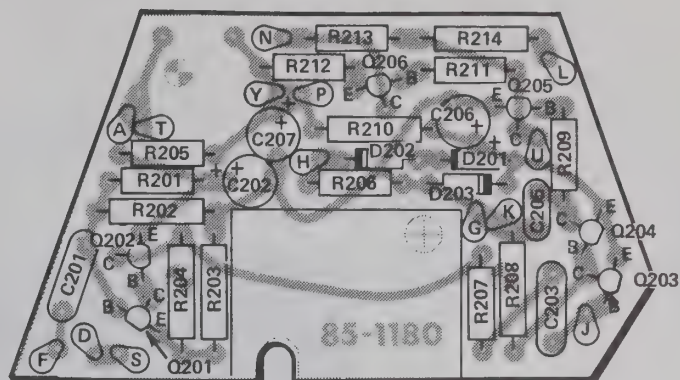
SEARCH COIL CIRCUIT BOARD  
(Viewed from component side)



SEARCH COIL CIRCUIT BOARD  
(Viewed from foil side)

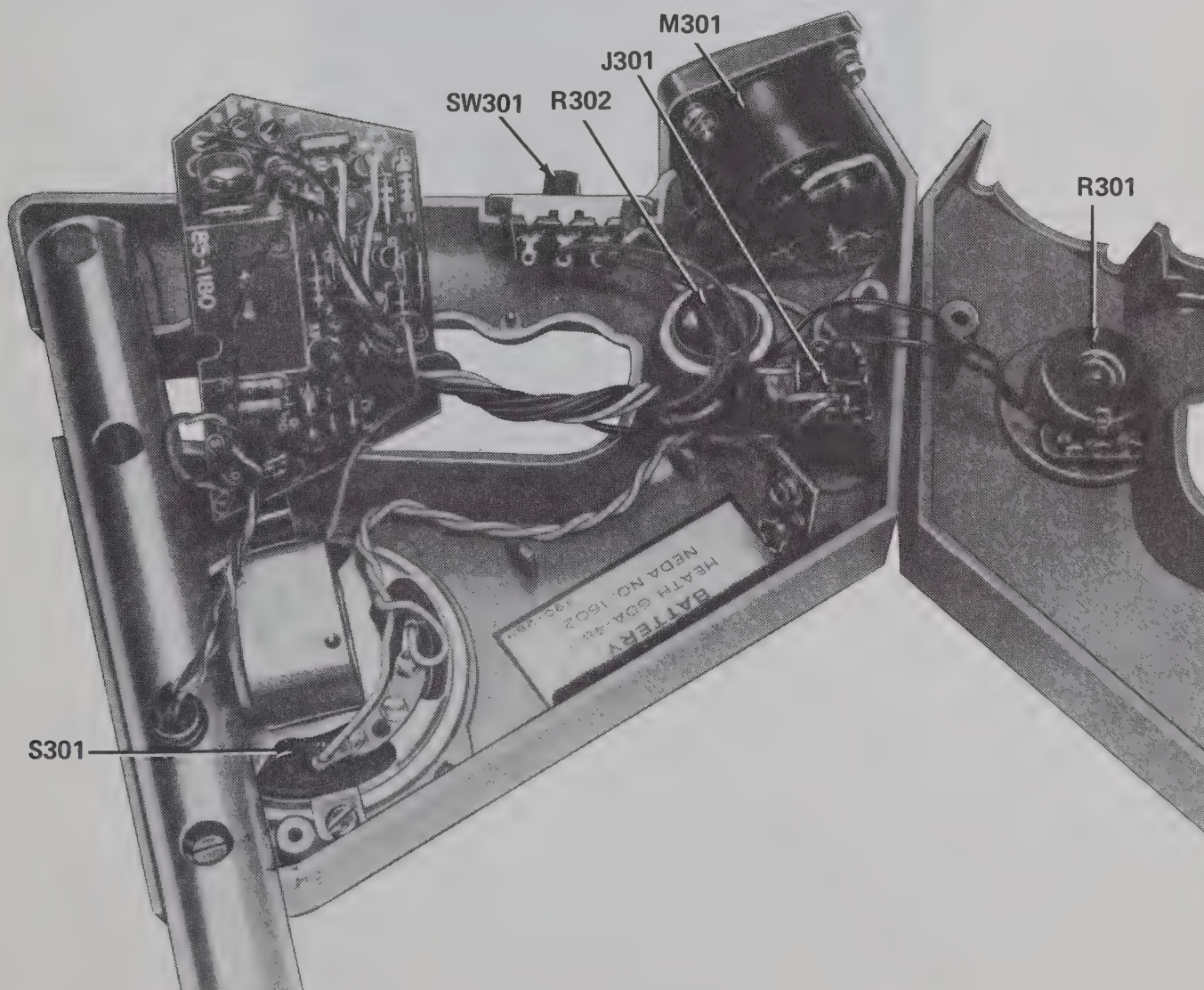


AUDIO CIRCUIT BOARD  
(Viewed from component side)

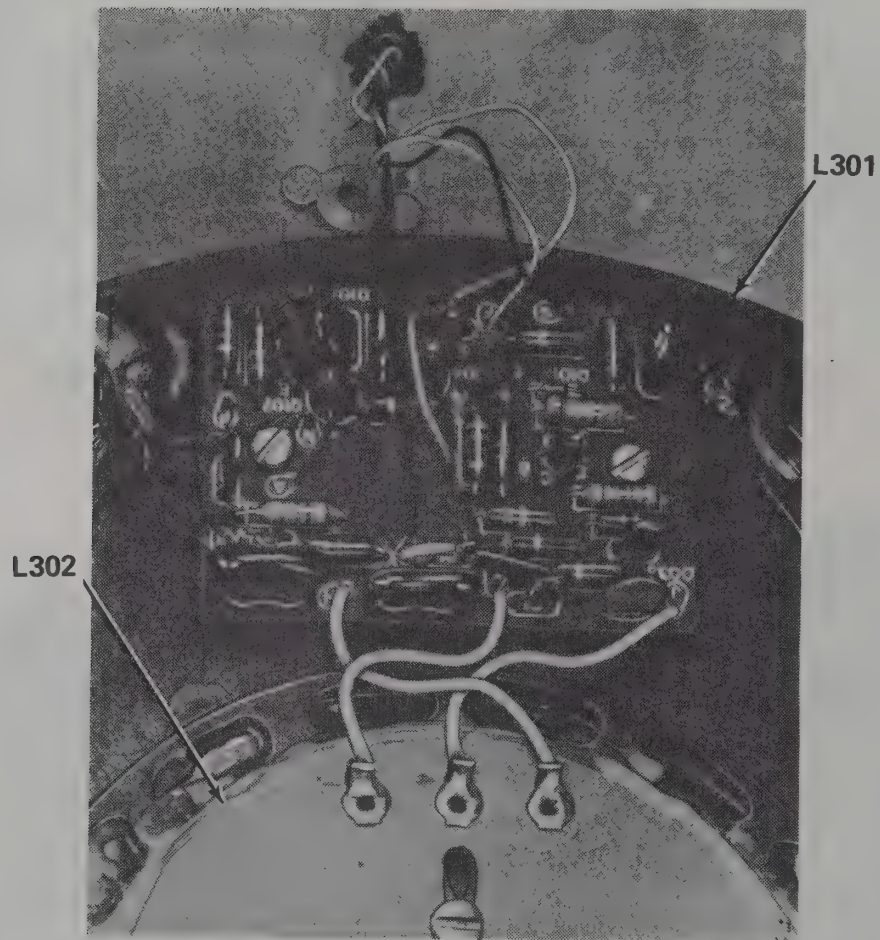


AUDIO CIRCUIT BOARD  
(Viewed from foil side)

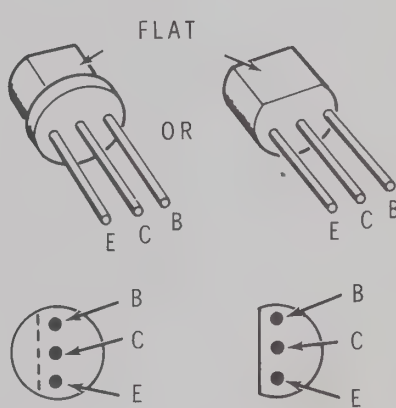
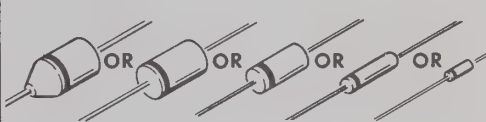
## IDENTIFICATION PHOTOGRAPHS



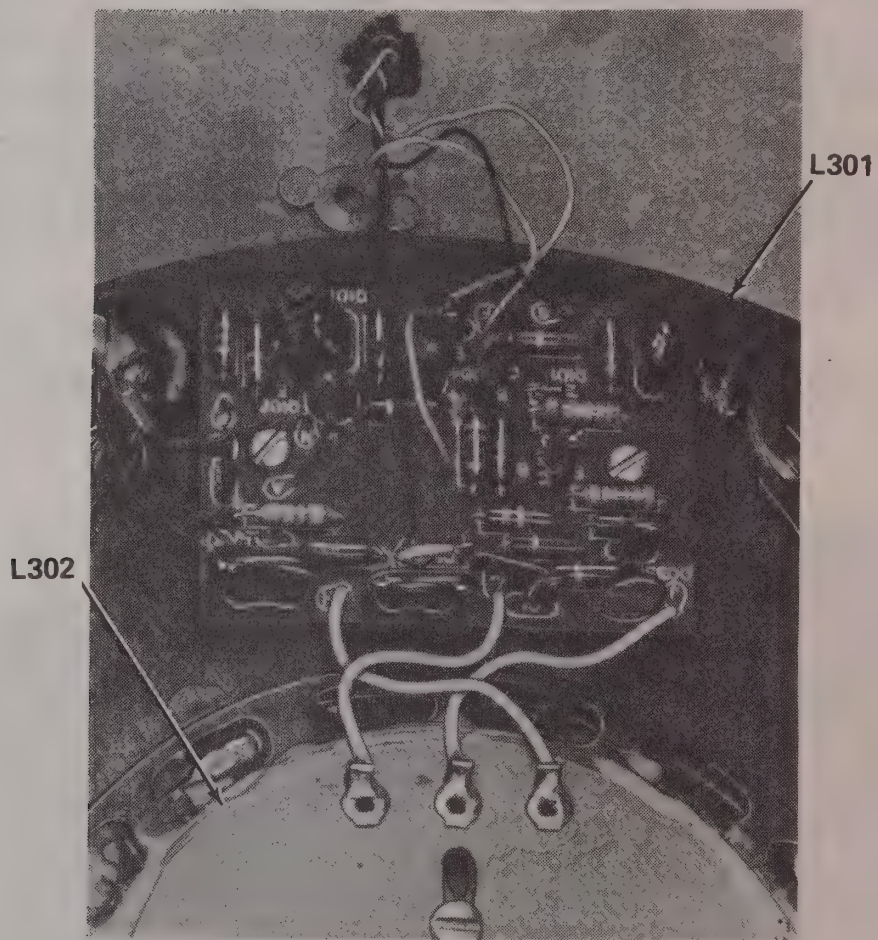




# SEMICONDUCTOR CHART

COMPONENT NUMBER	HEATH PART NUMBER	MAY BE REPLACED BY	DESCRIPTION	LEAD CONFIGURATION
Q103 Q201 Q205	417-118	2N3393	NPN TRANSISTOR	
Q102	417-94	2N3416	NPN TRANSISTOR	
Q101, Q104 Q202, Q203 Q204, Q206	417-201	X29A829	PNP TRANSISTOR	
D101 D201 D202	56-56	1N4149	DIODE	<p>HEATH PART NUMBERS ARE STAMPED ON MOST DIODES.</p> 
ZD203	56-63	MZ500-10	ZENER DIODE	

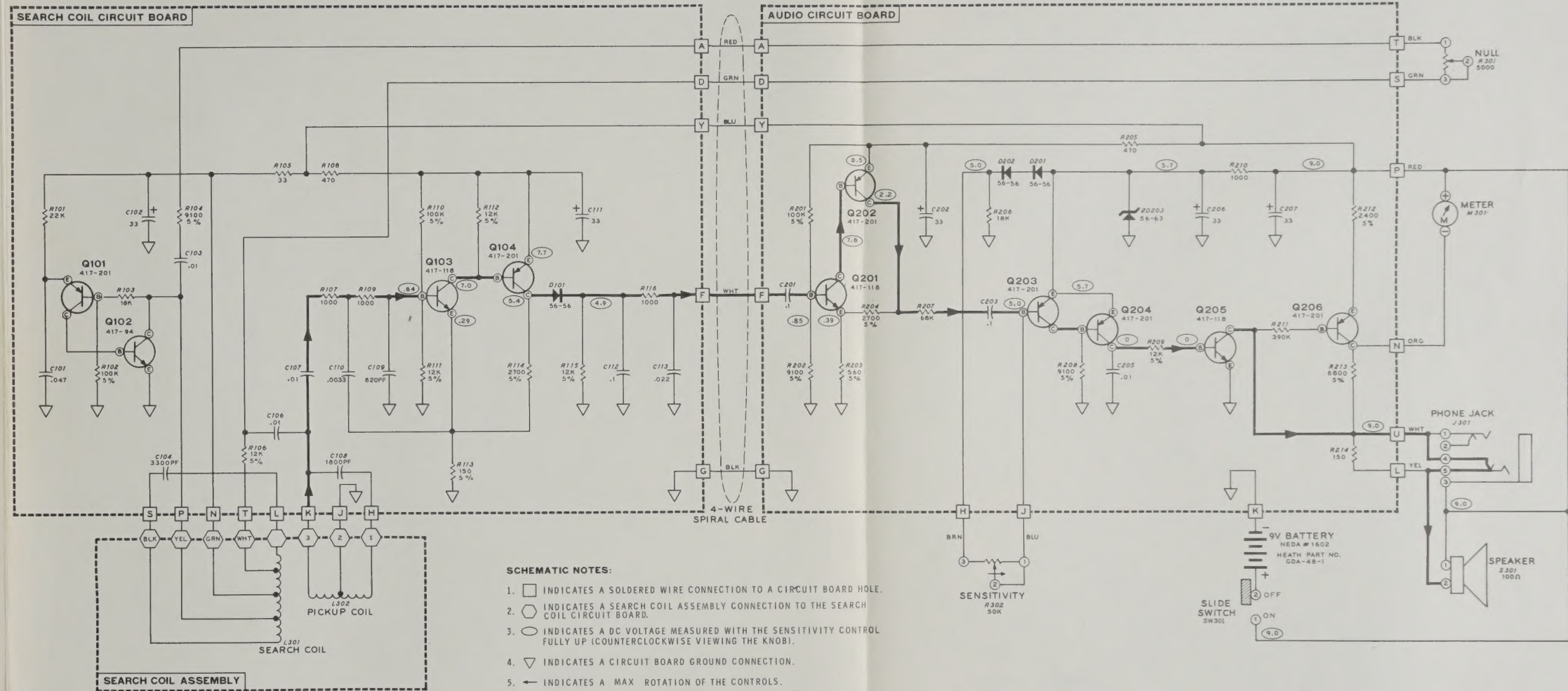






# SEMICONDUCTOR CHART

COMPONENT NUMBER	HEATH PART NUMBER	MAY BE REPLACED BY	DESCRIPTION	LEAD CONFIGURATION
Q103 Q201 Q205	417-118	2N3393	NPN TRANSISTOR	
Q102	417-94	2N3416	NPN TRANSISTOR	
Q101, Q104 Q202, Q203 Q204, Q206	417-201	X29A829	PNP TRANSISTOR	
D101 D201 D202	56-56	1N4149	DIODE	<p>HEATH PART NUMBERS ARE STAMPED ON MOST DIODES.</p>
ZD203	56-63	MZ500-10	ZENER DIODE	



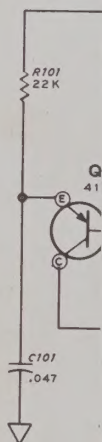
## SCHEMATIC NOTES:

- INDICATES A SOLDERED WIRE CONNECTION TO A CIRCUIT BOARD HOLE.
- INDICATES A SEARCH COIL ASSEMBLY CONNECTION TO THE SEARCH COIL CIRCUIT BOARD.
- INDICATES A DC VOLTAGE MEASURED WITH THE SENSITIVITY CONTROL FULLY UP (COUNTERCLOCKWISE VIEWING THE KNOB).
- ▽ INDICATES A CIRCUIT BOARD GROUND CONNECTION.
- ← INDICATES A MAX. ROTATION OF THE CONTROLS.
- INDICATES SIGNAL PATH.
- ALL VOLTAGES WERE MEASURED WITH AN 11 MEGOHM VTVM (OR EQUIVALENT) FROM THE POINT INDICATED TO CIRCUIT GROUND.
- ALL CAPACITORS ARE IN  $\mu$ F UNLESS OTHERWISE SPECIFIED.
- ALL RESISTORS ARE 1/2 WATT 10% TOLERANCE UNLESS OTHERWISE SPECIFIED.

SCHEMATIC OF THE  
HEATHKIT®  
DELUXE METAL LOCATOR  
MODEL GD-348



SEARCH COI

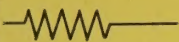

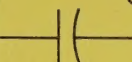
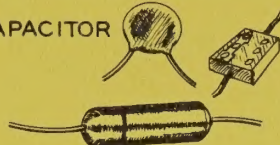
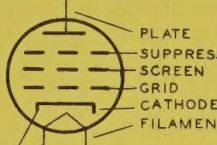

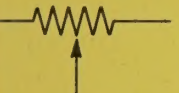
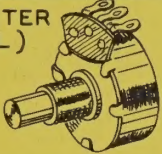
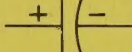
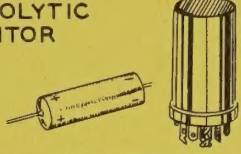
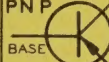

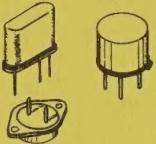

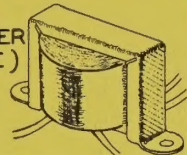
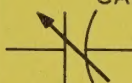
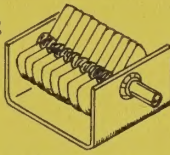

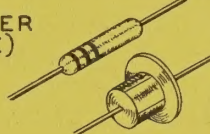


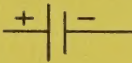
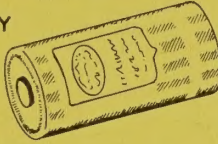

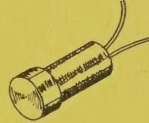
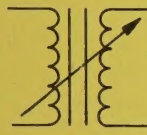

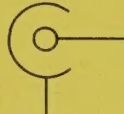



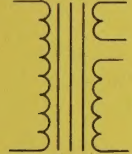
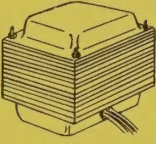
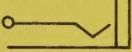
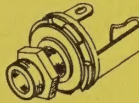





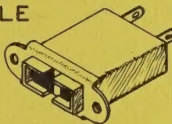

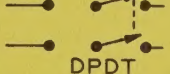
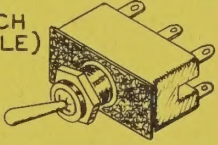
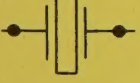

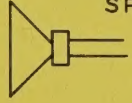
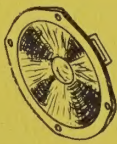
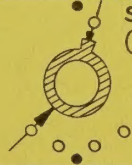

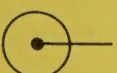
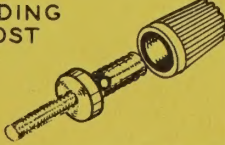
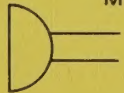
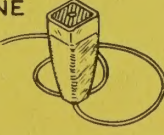
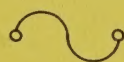
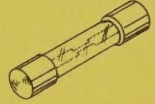


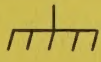

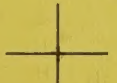

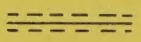




# TYPICAL COMPONENT TYPES

This chart is a guide to commonly used types of electronic components. The symbols and related illustrations

should prove helpful in identifying most parts and reading the schematic diagrams.

<b>RESISTOR</b>  	<b>CAPACITOR</b>  	 <b>TUBE</b> PLATE SUPPRESSOR SCREEN GRID CATHODE FILAMENT 
<b>POTENTIOMETER (CONTROL)</b>  	<b>ELECTROLYTIC CAPACITOR</b>  	<b>TRANSISTOR</b> PNP BASE COLLECTOR EMITTER NPN BASE COLLECTOR EMITTER   
<b>TRANSFORMER (IRON CORE)</b>  	<b>VARIABLE CAPACITOR</b>  	<b>RECTIFIER (DIODE)</b>  
<b>TRANSFORMER (ADJUSTABLE POWDERED IRON CORE)</b> ARROW INDICATES DIRECTION OF CORE MOVEMENT TO INCREASE INDUCTANCE  	<b>BATTERY</b>  	<b>NEON BULB</b>  
<b>TRANSFORMER (ADJUSTABLE CORE)</b>  	<b>PHONO JACK</b>  	<b>ILLUMINATING BULB</b>  
<b>POWER TRANSFORMER</b>  	<b>PHONE JACK</b>  	<b>METER</b>  
<b>INDUCTOR (COIL)</b>  	<b>RECEPTACLE</b>  	<b>SWITCH (TOGGLE)</b> SPST DPDT   
<b>PIEZOELECTRIC CRYSTAL</b>  	<b>SPEAKER</b>  	<b>SWITCH (ROTARY)</b>  
<b>BINDING POST</b>  	<b>MICROPHONE</b>  	<b>FUSE</b>  
<b>ANTENNA</b> GENERAL  LOOP 	<b>EARTH GROUND</b>  <b>CHASSIS GROUND</b> 	<b>CONDUCTORS</b> NOT CONNECTED  CONNECTED  SHIELDED 



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